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INTESTINAL OBSTRUCTION FOLLOWING OPERATIONS ON THE LOWER PART OF THE ABDOMEN.¹

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IN dealing tonight with intestinal obstruction following operations on the lower part of the abdomen, it seemed to me best to be brief and to confine myself to the diagnosis and to leave the description of actual cases and treatment to Dr. Schlink.

Before confining ourselves to post-operative intestinal obstruction the main causes of intestinal obstruction may be mentioned in passing (*vide* Rose and Carless).

There are two great divisions of intestinal obstruction—dynamic and mechanical.

Dynamic ileus is due to some paralytic or spasmotic condition of the intestinal wall preventing the onward passage of its contents, for example:

- (a) diffuse or localized acute infective inflammation, (b) torsion of intra-abdominal viscera, (c) embolus or thrombosis of the mesenteric vessels, (d) nervous lesions.

Mechanical ileus is the more common. It may be due to: (a) strangulation of the gut by bands of apertures, (b) kinking of the gut over bands with occlusion of lumen and interference with blood supply, (c) twisting of the intestine on its own axis-volvulus, (d) intussusception, (e) blocking of the lumen by foreign bodies or accumulation of faeces, (f) narrowing of the bones, or cicatricial or cancerous stenosis or the pressure of external tumours.

1. When the upper part of the small intestine is involved, vomiting is early, tumultuous, persistent and bilious in character. Abdominal distension involves the epigastrium.

2. When the lower part of the small intestine and the caecum are involved, faeces and flatus cannot pass, vomitus is offensive, meteorism is marked and involves the central part of the abdomen.

3. When the colon or rectum is involved, vomiting is late in appearing, meteorism is marked and involves the flanks as well as the centre.

¹ Read at a meeting of the New South Wales Branch of the British Medical Association on September 28, 1933.

It is taken for granted that the surgeon has made a correct diagnosis and that the intestinal obstruction is due to the operation itself and not to some unrecognized condition present at the time of operation.

It will be as well to discuss simple post-operative distension, paralytic ileus (post-operative peritonitis), acute dilatation of the stomach, intestinal obstruction (post-operative mechanical ileus).

Let us suppose that the patient's condition is quite satisfactory during the day of operation, but when the patient is visited next morning he does not appear to be as well as one expected. He looks rather tired, complains of abdominal discomfort, and has some abdominal distension; also the nurse reports that he did not have a good night, but that the temperature and pulse are normal and post-anæsthetic vomiting has not been excessive. On examining the abdomen one may find that there is some distension, but that the abdomen feels soft. One may order bicarbonate of soda to be taken by mouth and the rectal tube to be passed; if flatus is expelled and the patient feels more comfortable a sedative may be ordered. On the other hand, if the distension and discomfort increase and the patient is restless and inclined to vomit, the surgeon experiences a little anxiety and may order one cubic centimetre of pituitrin or 1.3 milligrammes (one-fiftieth of a grain) of eserine; either of these may be repeated in four hours. If no relief is obtained by these measures a small glycerine enema may be given and, if necessary, the stomach tube passed; if there is still no improvement after a period of rest a soap and water enema with turpentine added may be ordered, and another one cubic centimetre of pituitrin given at the same time, and no food allowed by mouth. If a satisfactory result is not obtained after another period of rest an enema of milk and molasses may be tried. (Milk and molasses enema: hot milk two pints, one breakfast cup of molasses stirred into it; do not beat the milk after the molasses has been added nor add soapy water, otherwise the milk will curdle.) If still no relief is secured and the distension, discomfort and pulse rate have increased and vomiting or hiccup persists after the patient has a hypodermic injection of morphine, the surgeon's anxiety is great, and he has to weigh the possibilities of the condition being due to paralytic ileus, acute dilatation of the stomach, general infective peritonitis or intestinal obstruction. These conditions are fully discussed in an excellent article, of which I have made free use, by H. W. L. Molesworth, entitled "Some Principles of After Treatment in Acute Abdominal Disease," published in *The British Medical Journal*, February 11, 1922, page 218.

In post-operative paralytic ileus examination of the patient will disclose that he presents the appearance of great discomfort, but not that of actual pain. Vomiting and thirst may be distressing and the pulse rate increasing and temperature slightly raised. There is a complete absence of paroxysmal pain, abdominal rigidity and no visible or audible

peristalsis. Gastric lavage may relieve the vomiting. If pituitrin or eserine does not relieve the distension and secure the passage of flatus, and the surgeon, after weighing the evidence before him, is satisfied that the distension is due to paralytic ileus, morphine should be given and rest secured for the patient, fluid being administered by every possible means.

If the condition is due to acute dilatation of the stomach the patient gives the appearance of great distress. There is marked prostration with a feeble pulse, and urine is scanty. Occasionally there may be small vomits of bile stained fluid with eructations and perhaps hiccup, but more frequently large quantities of bile stained sour smelling fluid, with great belching of wind. Breathing is distressed and of the thoracic type. An examination of the abdomen will reveal marked distension, especially in the epigastrium and on the left side. The passage of the stomach tube may remove many pints of fluid, although the patient has been vomiting large quantities, and give the patient immediate relief. Fluid must be administered by every available method and the patient placed in the prone position, head low, with a pillow under the pelvis, the foot of the bed being raised. The stomach tube must be passed every four hours and the stomach washed out with sodium bicarbonate solution, seven grammes to a litre (60 grains to a pint) till the stomach contains less than 120 cubic centimetres (four ounces) on passing the tube.

If the patient is suffering from general infective peritonitis he will present the picture of shock, extreme restlessness and anxiety, with mental alertness, accompanied by marked abdominal rigidity and great abdominal pain, which is continuous and causes the legs to be drawn up; and there is repeated effortless vomiting of dark and faeculent material with rapidly increasing pulse rate and complete stasis of the bowels. The tongue is dry and thirst distressing. Urine is scanty. Any operative interference is likely to hasten the fatal issue, all that can be done is to give morphine, supply fluid *per rectum*, subcutaneously or intravenously, together with gastric lavage.

If towards the end of the first week a patient who has been causing anxiety or who may have been apparently quite well, complains of colicky pains in the abdomen, gradually increasing in severity, with distension but not marked rigidity, one immediately suspects the onset of intestinal obstruction. If there is visible peristalsis with vomiting, the diagnosis is clear, even though some result has been obtained from the enema. Immediate operation is imperative. If in doubt, open the abdomen; do not wait till late signs of obstruction are evident.

In conclusion pay attention to the complaints of a patient, no matter how trivial, and do not leave the after-treatment to the nurse, as it is neither fair to the nurse nor the patient and often results in the early signs of intestinal obstruction being overlooked.

POST-OPERATIVE INTESTINAL OBSTRUCTION IN THE LOWER PART OF THE ABDOMEN.¹

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My remarks this evening will be confined to acute intestinal obstruction, following gynaecological operations, and will be based mainly on the cases which have come under my own care. I will leave the more general causes of obstruction to my colleague, Dr. Aspinall, who is a general surgeon, and so more fitted to speak about them.

My earliest personal experiences of acute post-operative intestinal obstruction were gained in the *post mortem* room during a term of acting resident pathologist at the Royal Prince Alfred Hospital. I performed *post mortem* examinations on several patients who had been operated upon for double pyosalpingitis. As I emptied out the distended and overloaded gut, I was greatly impressed to see the ease with which the obstructed knuckle of ileum pulled away from its lymph-glued attachment to the area from which the tube had been removed. This occurred without any pull, but merely by the weight of the distended and overloaded intestines hanging out of the abdomen. These abdomens had not been reopened, the condition having been mistaken for general peritonitis. I there and then made up my mind that when I started my operative career I would never hesitate to reopen my patient if I suspected obstruction.

It was a long time before an actual clinical experience confronted me. I had performed nearly a thousand sections, and was beginning to think that post-operative obstruction was a myth when each week for four consecutive weeks I met with this grave and most serious of all post-operative complications, and I have met with it off and on since.

Signs and Symptoms.

The course of a fatal case of post-operative obstruction is fairly definite, depending on two factors; the first and least important is the actual obstruction, and the second and really fatal factor is the toxæmia due to septic absorption from the distended, congested and at times ulcerated bowel above the site of the blockage. The symptoms and signs appear according to the stage the obstruction has reached, which means the length of bowel above the block affected by distension and the amount of septic contents that has accumulated. Occasionally they are influenced by the existence of primary or secondary peritonitis. In my experience the first and most reliable sign of impending or commencing obstruction is a sudden increase of pulse rate with an accompanying fall of temperature, even to sub-normal. This crossing on a chart, coupled with a continuation of vomiting after the post-anæsthetic sickness should have passed away, is the most

significant factor in the early diagnosis of this serious post-operative complication. The vomiting which comes on gradually at first and only at intervals continues to increase in frequency, and towards the end becomes almost continuous. There may or may not have been one or several attacks of spasmodic pain in the lower part of the abdomen at the beginning, but as the obstruction nears completion, waves of peristaltic pain are at times felt by the patient, and occasionally seen by the observer. There is at first little or no distension, and usually no ascertainable rigidity of the abdominal wall. The bowels may have opened once or twice by enemata and flatus as well as feces may have passed. As the obstruction advances the pulse becomes feeble and running, the vomiting unremitting, the abdominal distension a marked feature, and the bowels cease to act. When the obstruction is absolute, intestinal action ceases altogether, pain if it was present disappears except in cases that are complicated by new spreading peritonitis. Usually there is only discomfort and dyspnoea, due to the drum-like distension of the abdomen. As all intestinal action has stopped the bowel above the block becomes loaded with retained and septic contents, which as well as being vomited are absorbed, resulting in an intense general intoxication, which reflects itself in the patient's features, and hastens the end.

Causes of Obstruction.

1. Post-operative obstruction is most commonly caused by a loop of the lower part of the ileum reentering the pelvis, its normal habitat, and becoming glued by lymph to the line of suture, closing the area from which an infective organ, tube, ovary, uterus or appendix has been removed. It is interesting to note that in many of the cases in which this type of obstruction develops there is a very short meso-sigmoid which prevents the large bowel with its protective *appendices epiploicae* from falling over the area of operation and so serving as a buffer between it and the small bowel. *Per contra* patients with a redundant sigmoid, which is allowed by a long mesentery to fall down and cover the operated area are very rarely attacked by this post-operative complication. In most cases the actual exciting cause of the ileum fixation is a patch of localized peritonitis which, by exuding infective lymph, forms a good nidus for gluing down the loop of small gut. In like manner collections of blood in the pelvis following bad hæmostasis are a frequent source of this type of post-operative obstruction, due to the clot becoming attached to the small gut as it undergoes the process of organization, and so causing bowel fixation. In my opinion another causative factor is the use of too fine a cat gut for the covering peritoneal suture as it absorbs too readily and allows the raw surface to reopen, resulting in an intraperitoneal wound, to which the bowel becomes easily attached. This especially occurs where sections of the uterine musculature have been made, that is, intramural excision of tubes or subtotal hysterectomy. All

¹ Read at a meeting of the New South Wales Branch of the British Medical Association on September 28, 1933.

surgeons operating on previously sectioned patients must have observed the frequency with which small gut or omentum is attached to a residual cervical stump or to the cornu of the uterus from which a tube has been removed. Other causative factors are injury to the small bowel by rough handling, severing of adhesions, undue pressure by abdominal sponges or scalding if they be overheated. Even the spilling of pure carbolic acid on the ileum when used for the stump of the appendix might be a possible starting-point for obstruction.

Predisposing causes of obstruction are the undue use of morphine and the continued dorsal position during the first few post-operative days, a combination of factors that impedes the normal peristaltic action of the pelvic loops of the bowel and allows them to remain passively in juxtaposition to the area newly damaged by the surgical procedure. The withholding of food by mouth for too long a period and the administration of unsuitable aperients might even add their weight, for we know that food initiates normal peristaltic waves, and that unsuitable aperients cause, as it were, a stuttering or reversal of these normal involuntary movements of the intestines.

There is not the least doubt that many patients avoid obstruction by a hair's breadth, and that the threatening obstruction is often cleared either by posturing, proper nursing in the matter of enemata and aperients, washing out of the stomach and appropriate feeding. As regards posturing I feel certain that I counteracted one case of impending obstruction by having the patient carried on a stretcher head first downstairs and gently jolted on the journey. Dr. Worrall used to advocate raising the pelvis by the legs and jerking the intestines out of the pelvis.

The psychical factor cannot be neglected when considering this subject of obstruction. The fear of death awakened in a patient's mind by the too frequent visits of numerous and different doctors, resident and honorary, has an undoubted influence on peristaltic action, and is important in those cases which are hanging in the balance. Measures should always be taken to allay anxiety and fear in the patient when the question of obstruction is one of "to be or not to be".

Most of the cases that have occurred in my practice can be classified under this first heading of causes of obstruction.

2. A less frequent cause of post-operative obstruction is paralytic stasis of the bowel, due to a paralysis of the motor mechanism of the gut brought on either by toxæmia, nervous shock, over-distension, trauma, exposure or some other factor. True paralytic stasis unaccompanied by peritonitis is an extremely rare cause of death, because the bowel tone usually recovers with palliative measures and normally empties the distended portion of the gut. However, I have met with two fatal cases which must be regarded as pure paralytic stasis of the gut.

In one the stasis affected only the large gut, which dilated to an enormous size from the *caput caecum* to the first part of the rectum. The cardinal sign was distension, which took ten days to reach the maximum. There was very little vomiting until the end, and the patient looked as if she would recover several times during the course of the illness, but ultimately died with a drum-like abdomen. She was a woman of fifty, and had had an operation for *prolapsus uteri*. At the *post mortem* examination the whole of the large gut was distended to the size of a woman's thigh, filling up the abdomen and pushing the diaphragm up almost to the fourth rib. There was no sign whatever of peritonitis.

The second patient had had a hysterectomy for fibromyoma, and eight hours afterwards she commenced to distend, with pulse 158 and temperature 38.9° C. (102° F.) until she was drum-like fourteen hours after operation. Enemata, eserine and other treatment were given, with the result that the bowels were well opened, much flatus passed and the distension was reduced six hours later. The abdomen again rapidly became distended and, despite enemata and gastric lavage, the patient died thirty-four hours after operation with an abdomen distending to the point of bursting. Unfortunately, a *post mortem* examination was refused, but I regard the case as one of pure paralytic stasis as an insufficient time had elapsed for peritonitis to have caused such abnormal distension. The operation had taken thirty-five minutes to perform and the patient left the theatre in good condition.

Apart from such rare cases of pure intestinal stasis I believe with Molesworth:

that most of the so-called paralytic ileus cases are due to a widely-spread plastic peritonitis, which is a mechanical bar to peristalsis; not that there is localized obstruction complete at any one point and to be relieved by operation, but as it were a brake applied over a considerable amount of intestine. Cases diagnosed as ileus are therefore more truly described a post-operative peritonitis, in which the gut dilates because it is inflamed.

Many of these patients recover without operation, because, if tone is restored, the gut can empty itself as no actual mechanical obstruction is present.

3. Other causes of pure obstruction without any primary peritonitis, apparent damage or fixation at the site of obstruction are *volvulus*, *spasmodic stricture* of the gut and *intussusception*. I have experienced one case of *volvulus* after the removal of a very large left ovarian cyst, which occupied almost the whole of the abdomen crowding the small intestine into the right kidney area. On reopening the abdomen I found a fairly high loop of intestine which had completely twisted on itself without any sign of peritonitis and no fixation or gluing to the ovarian stump. The explanation of this condition of affairs may have been the too rapid use of their new-found space by the over-long imprisoned loops of small intestine. I have also experienced a *spasmodic stricture* of the small gut with secondary dilatation above the block which displayed no inflammation, injury, fixation or band at the site of obstruction. I have never experienced a case of post-operative *intussusception*, but should like to record an unusual case of acute *intussusception* in a girl of twelve which was not operated on at the time and developed into chronic obstruction.

The *intussusception* was of the *ileo-caecal* variety, and when I operated upon her two or three months after the acute attack, the *ileo-caecal* valve could be felt at the anus. By squeezing from below and gentle traction by the

assistant from above it unrolled with only a few splits in the peritoneum of the descending and transverse colon. The patient recovered and the intussusception did not recur.

A bismuth enema made the pre-operative diagnosis definite in this unusual case.

4. There are many special causes of post-operative intestinal obstruction, most of which are bands or kinks left after attacks of peritonitis or caused by adhesion of the omentum to the site from which an appendix, ovary or tube has been removed. Drainage tubes also often leave fibrous tracts that give rise to obstructive trouble, and a common late cause is the false ligament that develops in cases in which a ventro-fixation or suspension has been done. I know of several cases in which the intestine became strangulated around such bands. Hematoma of the mesentery or any other interference with the blood supply of the mesentery will cause obstruction. Occasionally the misadventure of including a loop of small intestine by a stitch when closing the peritoneum has led to acute obstruction. A loop of small bowel may burst through gaps in the peritoneum and become strangulated under an apparently healing wound. There are many other special causes of post-operative obstruction which I am sure members will be able to relate in the discussion to follow.

Diagnosis.

In no class of case is early and accurate diagnosis more necessary, for unless the obstruction is relieved before the septic contents of the bowel with its attendant toxæmia becomes excessive, the patient will die. The decision to reopen the abdomen is often hard to make, but we must ever keep before us that the earlier this is done, that is, before distension and toxæmia supervene, the greater will be the number of lives saved. In my opinion it mainly depends on two facts: a rapidly-increasing pulse with a temporary fall of temperature even to subnormal, and desultory continuation of vomiting after the anæsthetic vomiting of the first twenty-four hours should have passed away. Pain is not a constant factor, and the early distension might pass unnoticed. It is remarkable how many loops of intestine need to be distended before the distension is noticeable from outside the abdomen. The positive results from enemata are often misleading, and by the time a complete blockage is apparent, the condition is usually desperate, owing to toxæmic absorption from septic contents of the bowel. My advice is to be on guard when the pulse continues to rise with a temporary falling-off of temperature, especially in the presence of vomiting. When in doubt reopen the abdomen at once. It is better for a few abdomens to be opened unnecessarily than that the high mortality of delay should continue.

Before leaving the subject of diagnosis, I should like to offer a warning about the indiscriminate use of morphine. We all know that it is a sovereign remedy to relieve many cases of sudden acute

abdominal pain attended by sickness and mild collapse following pelvic operations, and there is no harm in the one dose, but if, as Lord Moynihan says, the condition of the patient is such that a second or larger dose of morphine is speedily called for, the suspicions of the surgeon should be on the alert and the probability of the condition being one of mechanical block should be borne in mind. The repeated administration lulls one into a sense of false security that the condition is trivial; and it is only at operation that we realize that the pathological condition within the abdomen has been constantly progressing and that much time in reopening has been lost with the weight against the patient's ultimate recovery. How often has one resident medical officer after another been called from his bed or his billiards to see a patient who is not doing well after operation, each administering the sovereign remedy against further interference with his sleep or his pleasure, the result being that when the honorary surgeon calls on his usual rounds he finds the patient almost moribund. This has happened to me on three occasions, four to six doses of morphine having been administered. Fortunately, the staff of our hospital has learnt its lesson, and now treats the sovereign remedy with respect.

Treatment.

Once the surgeon suspects obstruction, there should be no delay in reopening the abdomen, and he must realize that the relief of the mechanical obstruction is only half and the less important half of his duty. The more important half is emptying the overloaded bowel of its putrid and septic contents.

Operation.—Immediately before the administration of the anæsthetic the stomach should be washed out, as in all these cases the stomach participates in the distension and is full of foul fluid. If this is not done, the patient is apt to drown in her own vomit when unconscious. As regards the anæsthetic, gas and oxygen given by the modern machines are ideal for these collapsed patients, but failing this morphine with a minimum amount of ether given by the open method is quite suitable. As soon as the wound is reopened, the hand should be passed down into Douglas's pouch, as in nearly every case the obstructed loop will be found there. If it is not found there, the caecum should next be inspected, and if it is collapsed, we must rapidly examine the small intestine. Should the obstruction not be found after a few minutes, the intestines should be allowed to escape outside the abdomen and be surrounded by towels wrung out in warm saline solution. The obstruction, having been found, it is rapidly released, and our energies are directed towards the emptying of the distended bowel. This is best done by a cannula attached to the sucker machine. Plunge it into one of the distended loops and instruct your assistant to hold the gut so that the contents of the bowel run towards the cannula. You on your part must see

that the latter is held in the centre of the fluid, as it has a great tendency to come up against the wall of the bowel when the mucosa is sucked into and blocks the opening. When all the available septic intestinal contents are removed, a purse string suture is run around the cannula and tied as it is withdrawn.

In advanced cases where there are many loops of bowel distended the cannula may have to be introduced in several different places. The largest number of punctures that I have had to use is three. This negative pressure sucker is the most rapid method of getting rid of the bowel content, and since its introduction I have not lost one of the seven patients on whom I have operated.

If no sucker is available, a Moynihan tube must be used, but this method of emptying the bowel is much slower and less efficient, as it needs a large incision in the bowel which of itself is a great risk, as soiling of the peritoneum by spilling of the contents is more likely to occur. Further, the bowel must be sewn up afterwards; and the time taken for this in addition to the emptying would not allow it to be used in more than one place, whereas the cannula can be introduced into several loops in half the time.

In the very desperate cases no time can be spared to look for the obstruction. The first distended loop presenting in the wound which fortunately is usually the one immediately above the obstruction must be opened and a tube inserted. The mortality in such cases is extremely high, and if the patients do recover, all the dangers of a second operation for the faecal fistula have to be faced.

As regards paralytic ileus Studdiford advocates the use of spinal anaesthesia for the reason that the intestines are found in a state of contraction and that incontinence of faeces occurs after its administration. He quotes many successful cases, and says that the probable explanation of its effect is that the splanchnic inhibitory reflexes are blocked, so that the vagus motor reflexes have full play. It might have been useful in the two fatal cases of paralytic stasis which I described.

Preliminary Measures.—Before leaving this subject of treatment a word or two might be said about the trial measures taken to ward off obstruction. Enemata should be preceded by eserine and pituitary extract, although my experience with pituitary extract has not been very satisfactory. The rectal tube has little or no effect, as I believe in most cases it curls on itself and never reaches the sigmoid region. Gastric lavage and judicious use of oral feeding have been more satisfactory. Posturing is occasionally helpful and the free administration of fluids has a beneficial effect. Usually normal saline solution is administered *per rectum*, as it counteracts the hypochloremia due to the loss of chlorides in the vomitus. Some prefer glucose and sodium chloride (5% glucose in normal saline solution) and others prefer intravenous injections.

Conclusion.

1. The most important signs of impending obstruction after operation are: (i) rapid pulse, (ii) falling temperature, (iii) vomiting.

2. The most frequent cause is bowel fixation by inflammatory lymph or collections of blood in the pelvis. Paralytic stasis, not the result of peritonitis, is an extremely rare cause.

3. Success in treatment depends on early recognition and relief of the obstruction, but especially on the rapid emptying of the distended bowel by sucker machine. Most of my cases occurred in the first week after operation, except one that occurred seven weeks afterwards. This was an unusual case of primary carcinoma of the Fallopian tube and the loop was glued in Douglas's pouch. In my practice the frequency of post-operative obstruction has been roughly one in under 1,000 patients operated upon.

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CHEMICAL ANALYSIS OF NEWGROWTHS CORRELATED WITH THEIR PATHOLOGICAL EXAMINATION.¹

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AND

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THE growth of any tissue, whether neoplastic, reactive, or normal, can take place only as a result of multiplication of the individual cells of the tissue, and the nature of the tissue is determined by the special characteristics of the cells which compose it. These characteristics may be normally inherent in the cells, as shown in their ability to carry out the process of repair after a wound, or they may be abnormal and arise in response to some abnormal stimulus, known or unknown. The latter is exemplified in the case of malignant newgrowths (and to a less degree in the case of simple ones). Here the cells take on abnormal characteristics, indicated in their form and mode of growth, and as a result a tissue is produced which is abnormal in form and function.

There may have been many stimuli causing abnormal growth. The purpose of this paper was to examine the sodium, potassium, calcium, chloride, and nitrogen content of neoplastic tissue to see whether an outstandingly high concentration of any

¹ This work was carried out under the control of the Cancer Research Committee of the University of Sydney and with the aid of the Cancer Research and Treatment Fund.

one or all of these ions occurred, or whether any interesting ratio of any of these occurred, for example, the ratio of potassium to calcium, sodium to potassium, *et cetera*.

Part I gives a mental picture of the intricate type of material with which we are dealing, and Part II gives a brief summary of some of the work done in recent years, indicating that the ions with which we have dealt have a very definite physico-chemical rôle in modifying the properties of the organic matter of the cell, and further the properties of each other.

PART I.

Before the quantitative analyses of certain elements in the various specimens of newgrowths examined were made, it was recognized as essential that the pathological nature of each newgrowth should be identified by microscopic examination. This was in the first place qualitative, that is, only for purposes of diagnosis.

A number of specimens had been examined microscopically, when the great variety of form, seen even among newgrowths of the same class, suggested that the value of the results of chemical analysis would be increased if the amount of neoplastic tissue present in each specimen were estimated. As masses of neoplastic cells can be identified with certainty only under the microscope, it followed that the microscopic examination must be made quantitative as well as qualitative.

Quantitative Estimation of Neoplastic Tissue.

The only truly accurate method of making a quantitative estimation of neoplastic tissue would be by direct enumeration, that is, by cutting serial sections of known thickness through the whole of the piece of tissue to be analysed, and actually measuring the total amount of neoplastic tissue in the specimen. This method is obviously impracticable, as it would necessitate using the whole of the tissue for microscopic examination, and none would be left for chemical analysis (for which purpose the tissue must be fresh and not treated by fixatives).

Hence the microscopic estimation of neoplastic tissue must be indirect. That is, an attempt must be made to estimate the amount of neoplastic tissue in the whole of the specimen analysed, by actually measuring the amount of such tissue in small pieces removed for microscopic examination. This method involves a fairly wide margin of error, in view of the great variations which may occur in different parts of the one newgrowth. By the exercise of care in examining the fresh specimen and in removing the pieces of tissue to be sectioned, this margin of error may be reduced to a minimum.

The method used was as follows: The fresh specimen was trimmed of the fat, fibrous tissue, skin *et cetera*, so as to leave as far as possible only tissue which was heavily invaded by the newgrowth. From the trimmed specimen there were then taken one or more small pieces of tissue, which were

embedded and sectioned, the remainder being used for the chemical analysis. The sections were cut at a constant thickness, and the same tube length and combinations of lenses were used throughout, the magnification thus being kept constant. The eyepiece was a Number 3 squared micrometer ocular, and the objectives were the Zeiss "A" and "D," giving magnifications of approximately 80 and 320 diameters respectively.

In each section from fifty to one hundred low-power fields were counted, according to the extent of the variation between different parts of the section. The number of squares in each field which were occupied by neoplastic cells, and the numbers occupied by other cells or tissues, were counted. The total areas occupied by the various tissues and cells in the fields examined were thus expressed in terms of micrometer squares. As each section was of uniform thickness and this thickness was kept constant for all sections, the numbers of squares were also an expression of the volumes of the various tissues. From these figures the percentage of each tissue in the section was calculated. The figures obtained for each section were compared with those for other sections from different parts of the same specimen, and the average percentages of the various tissues throughout the whole specimen were calculated.

Proportions of Neoplastic and Other Tissues.

The percentage of true neoplastic tissue shows a very wide variation among different types of newgrowth, and even among individual newgrowths of the same type. This is indicated by the figures given.

The growing neoplasm is accompanied in its growth by a vascular connective tissue stroma which helps to support and nourish it, and which shows considerable variation in different newgrowths. Associated with the newgrowth there is also a very variable tissue reaction in the form of a fibro-cellular proliferation—a defensive reaction which the normal tissues are stimulated to produce by the invading neoplastic cells. Lastly, there may be a cellular reaction, also defensive, consisting of aggregations of lymphocytes and other cells around the advancing margin of the newgrowth.

These various tissues and cells are not neoplastic. They are chiefly reactive, but they are not normal; at least they are not present in the same proportion in normal tissues which have not been invaded by a newgrowth. They are, however, so intimately mixed and bound up with the cell masses of the newgrowth that it is not possible to effect a complete mechanical separation of neoplastic from non-neoplastic tissue by any known method.

Thus, when a carcinoma or other newgrowth is excised, there is, surrounding it and incorporated in it, a proportion of the non-neoplastic tissues and cells mentioned above. There is also a quantity of

normal tissue, as the surgeon's aim usually is to make his incisions well clear of the newgrowth.

Before the specimen is subjected to chemical or other analysis, all or nearly all the normal tissues and some of the reactive tissues can be removed by careful trimming. But, however carefully the trimming is carried out, there is nearly always incorporated in the newgrowth some proportion of the non-neoplastic reactive tissues and cells.

For instance, after being trimmed, an experimental sarcoma in an animal may contain 95% or more of sarcoma cells, an encephaloid carcinoma 80% or more, and a scirrhus carcinoma from 40% to 50% or less. The only cases in which a malignant newgrowth may be obtained nearly pure would appear to be some of the experimental animal sarcomata, and even they must contain some nutrient vessels and some intercellular material, though the latter may be at a minimum. Haemorrhage and necrosis are common in the highly cellular newgrowths, and may introduce further chemical complications.

If a specimen of tissue is taken from each of two different newgrowths, for example, a scirrhus carcinoma containing 15%, and an encephaloid carcinoma containing 60% of carcinoma cells, the figures obtained by quantitative chemical analysis of these might be grouped together under the one heading, "Carcinoma of the Breast" or "Carcinoma of the Stomach". But this would not take into account the fact that one specimen contained four times as much carcinoma tissue as the other. A statement of the different percentages of carcinoma cells would give more assistance in the interpretation of the results of analysis.

It is, of course, understood that a carcinoma consists essentially of invading epithelial cells and of such cells alone; any other tissue incorporated in it is not strictly carcinomatous, but may be reactive, nutrient, or defensive, as explained above.

When the chemical analysis of a specimen of tumour reveals any departure from the normal, there are several possibilities to consider. It may be: (i) that the abnormality is confined to the neoplastic cell masses, or (ii) that it predominates in them, or (iii) that it is equally distributed in the neoplastic cells and in the non-neoplastic stroma and reactive tissues, or (iv) that it predominates in or is even confined to these non-neoplastic tissues.

One cannot say which of these possibilities is the correct solution, so long as the mass of newgrowth is considered only as a whole. It is necessary to consider separately the neoplastic and the non-neoplastic tissues, before any progress can be made in this particular matter.

It is in an attempt to take some step in this direction that the estimations of the various proportions of neoplastic tissue have been made here.

Selection of Normal Tissues for Comparison.

Difficulties are encountered when it is desired to compare the results of chemical analysis of neoplastic tissue with those of a corresponding normal tissue. This is partly due to the difficulty of determining the tissue of origin of many newgrowths, and partly to the fact that many newgrowths differ very widely in structure and chemical composition from the tissues from which they originate.

Epithelial Newgrowths.

The epithelial series of newgrowths shows the least difficulty in this respect. For instance, an alveolar carcinoma of the breast may be taken as a whole (carcinoma cell masses *plus* stroma *plus* reactive tissues) and compared with normal breast tissue as a whole (gland epithelium *plus* stroma), the latter being obviously the normal tissues of origin of the neoplasm and its associated abnormal tissues.

An attempt may also be made to compare the cell masses only of the alveolar carcinoma with the normal gland epithelium—a more accurate comparison of the neoplastic with the corresponding normal tissue. Similarly a squamous epithelioma of the epidermis may be compared with normal epidermis.

In each of these cases the newgrowth arises from a highly specialized tissue. The cells of the newgrowth, both in form and in mode of growth, attempt to reproduce some at least of the special characteristics of the normal tissue from which they have grown. Further, the tissue of origin can usually be identified positively by microscopic examination.

Connective Tissue Newgrowths.

It is in the investigation of the malignant connective tissue series of newgrowths (the sarcomata) that the greatest difficulties are encountered. Malignant newgrowths in this series may arise from a highly specialized tissue, such as the osteogenic tissue, or from a less specialized one, such as fibrous tissue.

In many cases the newgrowth differs widely, both in form of cells and in mode of growth, from the normal tissue of origin; also, newgrowths of very similar appearance may originate from widely different tissues. As a result, though in some cases the tissue of origin can be identified positively, in many instances it is extremely difficult and even impossible to specify it with any degree of certainty.

Further, even when the normal tissue from which the newgrowth arose is known, the tendency of the neoplastic cells to revert to primitive and unspecialized cell forms and mode of growth presents a marked contrast to the specialized characteristics of the tissue of origin. For example, little or nothing would be gained by comparing the chemical analysis of normal bone with that of an osteogenic sarcoma.

This suggests strongly that in such cases, if inferences as to any chemical change characteristic

of neoplastic tissue in general are drawn from the chemical variations between a malignant connective tissue newgrowth and its normal tissue of origin, such inferences should be guarded, and should take into account the above considerations.

With regard to the simple (relatively non-malignant) connective tissue newgrowths, for example, fibroma, chondroma, *et cetera*, such a chemical comparison between neoplastic and normal tissues would be practicable, but the present investigation was limited to malignant newgrowths (with one exception).

Total Cellularity.

The percentage of all cells (neoplastic and non-neoplastic) in the tissue to be analysed must also be considered, in view of the possibility that any particular chemical change may not be confined to the cells of the newgrowth, but may also involve the other cells associated with it.

Rate of Growth.

Rate of growth gives another basis for comparison of one tissue with another. In this investigation the relative rates of growth of a series of newgrowths have been estimated, the estimation being made from the whole pathological picture, as shown under the microscope. The various specimens have been tabulated in order of increasing rapidity of growth, but no attempt has been made to express these rates mathematically.

PART II.

A. I. Kendall⁽¹⁾ gives the following excellent picture of a bacterium cell, which may be said to apply very well to the modern conception of the living body cell.

The cell substance is generally believed to be colloidal in character, with various chemical families, as enzymes, enmeshed within it, but somehow kept sufficiently asunder to prevent confusion, and freely moving crystalloids. This is a veritable hive of industry, in which oxidations and reductions, syntheses and analyses, assimilation and excretion occur with astonishing orderliness and marvellous precision.

The colloidal protoplasm of the cell is able to recreate its complex chemical structure, and also as the food supply varies, to change its composition with reference to as basic an element as nitrogen. The large surface area of the cell in proportion to its volume provides for ease of chemical interchange between the cell and its environment. The semi-permeable membrane regulates the ingress and egress of food substances, both for structure and energy and elimination of waste products.

Since colloids do not diffuse readily, then the various colloids, the soluble non-colloidal food stuffs, the products of metabolism and any other cell constituents are able to exist in harmony side

by side. Chemical reactions can go on in the colloidal matrix with nearly the same speed as in water.

Turning to the more detailed properties of the protoplasm of the cell, several features are well understood, even though the great underlying problem of origin and specificity is wholly unsolved.

The outstanding feature of the protoplasm from the physico-chemical viewpoint is its asymmetry. It contains proteins, which constitute the hereditary chemical architecture of the cell, made up of amino acids tied together in the manner and in the order which constitutes this specific architecture; and this protein complex possesses in the aggregate a dual asymmetrical activity. It reforms itself, in obedience to the urge of growth exactly upon its ancestral plan, weaving amino acids or their simple complexes into laevo-rotating specific proteins of like kind. Structural vital constituents as proteins are commonly laevo-rotating, while energy-giving vital constituents are usually dextro-rotating.

It is sodium, potassium, calcium and chloride constituents of the crystalloids with which this paper is mainly concerned. Searches into the literature as to the effect of various ions upon the diffusion of each through semi-permeable membranes, the physical properties of semi-permeable membranes and the alteration in physical state caused by the ions have thrown some light on what one might expect to happen in and about live cells.

G. H. A. Clowes⁽²⁾ considers that the alteration in permeability of the living cell membrane is due to the action of electrolytes and metabolic products on delicately balanced interfacial soap films and emulsion systems. For example, an emulsion of oil in water which has a comparatively low electrical resistance can be changed by shaking it with calcium chloride to one of water in oil which has a high resistance at the critical point at which oil becomes the critical phase.

This fits in with the fact that alkalis, sodium, potassium *et cetera*, make the tissues more permeable, while salts of calcium, magnesium, and other divalent and trivalent cations exert the reverse effect.

H. B. Weiser and C. A. Cunningham⁽³⁾ have shown that the character of precipitated sulphur can be made to vary continuously from gelatinous and reversible to plastic and completely non-reversible when thrown down in the presence of a lyotropic series of ions from lithium to caesium and from magnesium to barium. Neutralization of Oden's sulphur solution below the critical value with a highly hydrated, weakly adsorbed ion, such as lithium or sodium, gives a gelatinous precipitant composed of the individual miscelles separated by a film of adsorbed water. Such a precipitant is readily reprecipitated by washing out the neutralizing ion. When the sulphur solution is neutralized with a slightly hydrated, strongly adsorbed ion, a plastic

precipitant is obtained, in which the individual particles have lost their identity due to coalescence. A precipitant of this type is not reversed by very thorough washing.

The order of hydration of the alkali cations is believed to be $\text{Li} > \text{Na} > \text{K} > \text{Rb} > \text{Cs}$; of the alkaline earth cations $\text{Mg} > \text{Ca} > \text{Sr} > \text{Ba}$. Recent theories of strong electrolytes would indicate that H is highly hydrated.

The Donnan theory states that the ions (here the proteins inside the cell act similarly) inside a semi-permeable membrane which are unable to pass through it, affect the behaviour of those that do pass through by acting as if they attracted those of opposite sign (thereby increasing their concentration inside the membrane) and repelling those of the same sign (thus decreasing their concentration inside).

Loeb was the first to succeed in demonstrating that when a protein was placed in a collodion sack permeable to water and ordinary salts and to the protein, there was a difference of potential between the inside and outside of the membrane (membrane potential).

Loeb says in "Dynamics of Living Matter",⁽⁴⁾ 1906:

In 1899 I outlined a general theory of irritability which may be briefly summarized in the following sentences. The salts of electrolytes in general do not exist in living tissues as such, exclusively, but are partly in combination with proteids (or fatty acids). The salts of electrolytes do not enter into this combination as a whole, but through their ions. The great importance of these ion proteid compounds (or soaps) lies in the fact that, by the substitution of one ion for another, the physical properties of the proteid compounds change (e.g., their surface tension, their power to absorb water, or their viscosity or state of matter). We thus possess in these ion-proteid or soap compounds essential constituents of living matter, which can be modified at desire, and hence enable us to vary and control the life phenomena themselves. Life phenomena, and especially irritability, depend on the presence in the tissues of a number of various metal proteids or soaps (Na, Ca, K, Mg) in different proportions.

Loeb⁽⁵⁾ asks why is it that the blood of fishes can maintain a concentration in sodium chloride far below that of the ocean and far above that of fresh water in which they may be living. Why is it that the red blood corpuscles or the cells of muscles (probably cells in general) remain rich in potassium and entirely or almost free from sodium, while the blood is rich in sodium and poor in potassium? Why is it that the waste products which are formed in one part of the body diffuse into the blood but do not as a rule diffuse into other cells of the body?

Loeb shows in his paper the way in which the salts which surround a cell modify the properties of a cell in such a way as to accelerate the rate of diffusion of certain ions and retard the diffusion of other ions.

In 1910 Wasteneys and Loeb observed in their experiments on the egg of the fish *Fundulus* that calcium chloride and sodium chloride inhibited the

toxic effect of acids. Sodium chloride and calcium chloride accelerate the rate of diffusion of alkali (NaOH) into the egg, the latter being more effective than the former. However, the effect of sodium chloride and calcium chloride is very different on the diffusion of potassium chloride into the cell. A slight amount of sodium chloride accelerates the diffusion of potassium chloride into the egg, while a higher concentration of sodium chloride has the opposite effect. It is found that calcium chloride does not accelerate the rate of diffusion of potassium chloride through the cell wall. The accelerating effect of sodium salts increases with the valency of the anion. Entirely similar results are obtained for the rate of diffusion of rubidium through the egg membrane. The fact that salts accelerate rate of dissociated alkalis and retard the diffusion of dissociated acids, while they have no retarding influence on the rate of diffusion of non-dissociated acid (and perhaps also non-dissociated alkali) has probably some bearing on secretions.

In a paper entitled "Chemical Character and Physiological Action of the Potassium Ion",⁽⁶⁾ it is stated that the properties of potassium are not due to its radio-active properties, as it cannot be replaced by thorium and uranium. Isotonic solution of lithium chloride and sodium chloride will give rise to muscular twitchings, while potassium chloride and rubidium chloride will not. Experiments on the egg of *Fundulus* show that toxic solutions of salts with bivalent metals such as magnesium chloride or calcium chloride can be rendered less toxic by the addition of potassium chloride, rubidium chloride or caesium chloride, but not or practically not by the addition of lithium or sodium chloride. In similar experiments to the above it is shown that the ammonium ion acts like members of the potassium group. Results show that the toxic effects of lithium which occupies a position in the periodic table on one side of sodium chloride are mitigated by the addition of ions like potassium, rubidium and caesium occupying a position on the other side. The effect of potassium was found greater than the effect of rubidium which in its turn was greater than the effect of caesium. A mixture of lithium and potassium ions in proper proportion acts more like a solution of sodium ions than do lithium ions alone. It is shown that the tolerance of sea urchin eggs towards lithium can be increased 500% more if at the same time a certain amount of sodium ion is replaced by potassium, rubidium or caesium ions.

R. E. Stanton⁽⁷⁾ finds that by perfusing frogs for varying periods with potassium-free Ringer solutions having a pH ranging from 6.0 to 8.0 such solutions have little or no effect on the retention of potassium by muscle cells.

D. J. Lloyd⁽⁸⁾ says that:

There is at present no satisfactory theory to account for the antagonistic action of salts on the behaviour of living protoplasm. There is no doubt that it is funda-

mentally due to the influence of the salts in the cell proteins. There is sufficient evidence of antagonistic action in the domain of non-living colloids to make this much at least certain.

We see that to some extent the properties of our living tissue must depend on the types and concentration of salts, both inside and outside the cell, but owing to the complexity of our tissue we have no means at present of determining what proportion of ions is inside and what outside. We can only give an analysis of our tissue as a whole, together with its pathological analysis, which indicates the varying types of tissue present in any one specimen

examined. The results are presented in Tables I and II, and in the summary of the description of specimens examined microscopically.

The summary gives the pathological description of the series of breast tumours examined and some others. The chemical analysis of the breast tumours, together with some secondaries, and three specimens of normal breasts from which three of the neoplasms had grown, are set out in Table II, while in Table I are the results obtained from a heterogeneous collection of tissues which have been made available for analysis.

TABLE I.

Specimen.	Percentage Solid.	Chloride.		Potassium.		Calcium.		Sodium.		Nitrogen.
		Weight. ¹	M.C. ²	Weight.	M.C.	Weight.	M.C.	Weight.	M.C.	
Allantoic membrane of chick ..	4.79	(a) 3.29 (b) 68.9	19.7	(a) 0.78 (b) 16.3	4.18	(a) 0.18 (b) 3.75	0.94	(a) 2.56 (b) 53.4	23.2	
Tumour 1 J.R.S. ..	15.15	(a) 1.8 (b) 12.2	3.48	(a) 2.05 (b) 13.6	3.48	(a) 0.172 (b) 1.15	0.29	(a) 2.22 (b) 14.6	6.35	
Muscle 1, from same rat as above ..	23.0	(a) 0.51 (b) 2.22	0.347	(a) 3.99 (b) 17.4	4.46	(a) 0.292 (b) 1.27	0.32	(a) 0.694 (b) 3.9	1.3	
Tumour 2, Number 1 (sarcoma) ..	17.8	(a) 1.68 (b) 9.44	2.7	(a) 2.47 (b) 13.9	3.56	(a) 0.553 (b) 3.1	0.77	(a) 2.78 (b) 15.6	6.8	
Seven young rats, newly born ..	12.55	(a) 1.59 (b) 12.7	3.62	(a) 2.4 (b) 19.2	4.92	(a) 2.88 (b) 23.0	5.7	(a) 4.43 (b) 35.3	15.3	
Sarcoma Number 37C ..	18.3	(a) 1.03 (b) 5.6	1.6							
Muscle from same rat as above ..	25.1	(a) 0.826 (b) 3.2	0.91							
Human melanotic sarcoma (b) ..	16.93	(a) 1.423 (b) 11.3	0.32	(a) 4.0 (b) 23.7	6.1	(a) 0.162 (b) 0.95	2.38	(a) 0.767 (b) 4.54	1.97	11.5
Tumour 3 ..	25.4	(a) 3.2 (b) 12.6	3.6	(a) 14.1 (b) 3.6	3.6	(a) 0.223 (b) 0.88	2.2	(a) 0.895 (b) 3.5	1.52	2.75
Rabbit embryos ..	14.66									2.7
Tumour 5 ..	20.25									
Ox tumour 2, 7095 ..	22.2	(a) 1.69 (b) 7.6	2.1	(a) 1.96 (b) 8.8	2.25	(a) 7.25 (b) 32.7	8.2	(a) 1.99 (b) 8.56	3.7	10.57
Ox tumour 3 ..	14.5	(a) 1.58 (b) 10.9	3.1	(a) 2.57 (b) 17.7	4.54	(a) 0.0807 (b) 0.62	0.155	(a) 1.55 (b) 10.6	4.6	13.3
Tumour 9, 7173 ..	16.55	(a) 1.41 (b) 8.5	2.4	(a) 3.6 (b) 21.7	5.5	(a) 0.338 (b) 2.04	0.51	(a) 1.08 (b) 6.5	2.8	12.75
Muscle 9 ..	17.4	(a) 1.84 (b) 10.6	3.03	(a) 2.85 (b) 18.4	4.2	(a) 0.129 (b) 0.74	0.185	(a) 1.64 (b) 9.4	4.1	14.8
Lymph gland, normal, from which tumour 10 developed ..	23.5	(a) 1.39 (b) 5.9	1.7	(a) 2.96 (b) 12.6	3.2	(a) 0.725 (b) 3.08	0.77	(a) 0.080 (b) 0.38	0.165	
Muscle 12 ..	23.4	(a) 1.66 (b) 7.1	2.03	(a) 2.92 (b) 12.5	3.2	(a) 0.268 (b) 1.15	0.287	(a) 1.14 (b) 4.87	2.1	12.36
Lymph gland 12 ..	30.2	(a) 2.44 (b) 8.1	3.2							10.9
Salivary gland 12 ..	30.0	(a) 1.08 (b) 5.6	1.6	(a) 2.55 (b) 8.07	2.07	(a) 0.445 (b) 1.41	0.35	(a) 1.21 (b) 4.07	1.77	10.23
Muscle 15 ..	22.7	(a) 1.03 (b) 4.5	1.3	(a) 3.27 (b) 14.4	3.7	(a) 0.46 (b) 2.03	0.51	(a) 0.701 (b) 3.08	1.34	13.0
Tumour 21 (mouse) ..	17.3									
Muscle 21 ..	20.9									
M3 ..	11.6	(a) 2.5 (b) 21.5	6.1	(a) 1.47 (b) 12.7	3.25	(a) 0.162 (b) 1.4	0.35	(a) 2.735 (b) 23.5	10.2	13.72
M4 (soft glandular-looking mass) ..	14.6	(a) 2.52 (b) 17.2	4.9	(a) 1.87 (b) 12.8	3.3	(a) 0.112 (b) 0.77	0.192	(a) 2.42 (b) 16.5	7.2	11.69
M2 ..	14.6	(a) 2.9 (b) 14.9	4.25	(a) 1.38 (b) 7.1	1.82	(a) 0.087 (b) 0.45	0.112	(a) 2.19 (b) 11.3	4.9	13.9
M1 (tuberculosis) ..	16.8	(a) 1.26 (b) 7.5	2.1	(a) 3.98 (b) 23.6	6.1	(a) 0.087 (b) 0.52	0.13	(a) 1.27 (b) 7.5	3.25	13.8
Muscle 23 ..	23.8	(a) 1.15 (b) 4.8	1.37	(a) 0.54 (b) 2.26	0.58	(a) 0.202 (b) 0.86	0.215	(a) 1.39 (b) 6.1	2.65	13.51
Tumour 23 (mouse) ..	18.0	(a) 3.01 (b) 16.8	4.8	(a) 1.94 (b) 8.0	2.05	(a) 0.33 (b) 1.8	0.45	(a) 2.9 (b) 16.2	7.02	14.84
Tumour 22 (mouse) ..	18.5	(a) 2.99 (b) 15.2	4.6	(a) 0.82 (b) 4.4	1.13	(a) 1.003 (b) 0.54	0.135	(a) 3.04 (b) 16.4	7.1	15.96
Six rat embryos, probably three weeks old ..	9.05			(a) 2.74 (b) 30.1	7.7	(a) 0.3 (b) 3.3	0.83	(a) 1.98 (b) 21.9	9.5	
Tumour 32 ..	20.08	(a) 2.5 (b) 12.4	3.54	(a) 0.91 (b) 4.5	1.15	(a) 0.61 (b) 3.1	0.77	(a) 3.28 (b) 16.3	7.1	15.36
Tumour 33 ..	17.6	(a) 3.2 (b) 18.2	5.2	(a) 2.84 (b) 16.1	4.1	(a) 0.44 (b) 2.5	0.625	(a) 1.98 (b) 11.2	4.9	14.72
Tumour 34 ..	18.7	(a) 2.48 (b) 13.1	3.74	(a) 4.05 (b) 21.6	5.5	(a) 0.35 (b) 1.87	0.467	(a) 1.71 (b) 9.1	3.95	14.0
Ox tumour 1, 7093 ..	18.7	(a) 2.0 (b) 10.65	3.04	(a) 2.6 (b) 13.9	3.56	(a) 1.19 (b) 6.36	1.59	(a) 1.82 (b) 9.73	4.24	13.35
Tumour 12, 7262 ..	19.0	(a) 2.42 (b) 12.7	3.6	(a) 2.5 (b) 13.2	3.4	(a) 0.325 (b) 1.7	0.425	(a) 1.85 (b) 9.73	4.22	10.5
Tumour 20, 7387 ..	14.7	(a) 1.92 (b) 13.0	3.7	(a) 2.36 (b) 16.0	4.1	(a) 0.064 (b) 0.44	0.11	(a) 1.9 (b) 12.9	5.6	
Skin 30 ..	22.25	(a) 2.9 (b) 12.9	3.7	(a) 1.35 (b) 6.0	1.54	(a) 0.23 (b) 1.02	0.255	(a) 2.2 (b) 9.8	4.26	15.95

¹The figures in the several columns marked (a) and (b) represent milligrammes per gramme, estimated on (a) wet weight, (b) dry weight.

²M.C. = Molecular Concentration.

TABLE II.

Specimen.	Percentage of Whole Tissue which is Cellular.	Percentage Solid.	Chloride.		Potassium.		Calcium.		Sodium.		Nitrogen.
			Weight. ¹	M.C. ²	Weight.	M.C.	Weight.	M.C.	Weight.	M.C.	
4, 7005, Adenoma .. 10	37.0		(a) 1.065				(a) 0.325		(a) 0.663		
Dense Fibrous .. 20		12.0	(b) 8.8	2.5			(b) 2.7	0.69	(b) 5.52	2.4	12.6
Fibrocellular .. 70											
Cellularity .. 30											
6, 7036, Carcinoma .. 5	14.0										
Adenoma .. 5											
Lymphocytes .. 1											
Fat cells .. 5		24.5			(a) 0.69	0.72	(a) 0.257		(a) 2.03		
Fibrocellular .. 85					(b) 2.82		(b) 1.06	0.265	(b) 8.3	3.6	10.1
Cellularity .. 3.8											
14, 7258, Carcinoma .. 7	15.0										
Lymphocytes .. 7		27.0	(a) 1.95		(a) 1.61		(a) 0.27		(a) 1.48		
Fat cells .. 70			(b) 7.2	2.06	(b) 5.96	1.53	(b) 1.0	0.25	(b) 5.48	2.38	
Fibrocellular .. 16											
Cellularity .. 8											
27, 7656, Carcinoma .. 10	26.0										
Lymphocytes .. 5		27.8	(a) 2.23		(a) 1.21		(a) 0.31		(a) 1.90		
Fat cells .. 20			(b) 8.0	2.3	(b) 4.5	1.15	(b) 1.1	0.275	(b) 7.2	3.1	9.9
Fibrocellular .. 65											
Cellularity .. 17											
28, 7684, Carcinoma .. 25	35.7										
Adenoma .. 6											
Lymphocytes .. 2		23.67	(a) 2.2		(a) 1.63		(a) 0.108		(a) 1.56		
Fat cells .. 12			(b) 9.3	2.66	(b) 6.9	1.77	(b) 0.46	0.115	(b) 6.6	2.87	10.42
Fibrocellular .. 55											
Cellularity .. 5											
25, 7607, Carcinoma .. 18	21.5										
Lymphocytes .. 1		33.4	(a) 0.96		(a) 1.17	0.9	(a) 0.107		(a) 0.79		
Fat cells .. 30			(b) 2.86	0.82	(b) 3.5		(b) 0.32	0.08	(b) 2.35	1.02	6.63
Fibrocellular .. 51											
Cellularity .. 5											
24, 7590, Carcinoma .. 30	38.0										
Lymphocytes .. 30		15.7	(a) 2.48		(a) 2.3		(a) 0.27		(a) 2.3		
cells and plasma .. 4			(b) 15.8	4.5	(b) 14.6	3.74	(b) 1.72	0.43	(b) 14.6	6.35	14.5
Fat cells .. 1											
Fibrocellular .. 65											
Cellularity .. 6											
35, 7775, Carcinoma .. 40	41.5										
Lymphocytes .. 1		10.05	(a) 2.42		(a) 1.37		(a) 0.18		(a) 2.17		
Fat cells .. Nil			(b) 24.0	6.9	(b) 13.6	3.5	(b) 1.79	0.447	(b) 20.6	8.95	
Degenerate tissue .. 50											
Fibrocellular .. 10											
Cellularity .. 8											
16, 7307, Carcinoma .. 20	27.0										
Necrotic .. 1											
Lymphocytes .. 1		17.45	(a) 1.81		(a) 2.37		(a) 0.12		(a) 1.74		
Fat cells .. 5			(b) 10.4	2.97	(b) 13.6	3.5	(b) 0.69	0.172	(b) 10.0	4.35	13.9
Blood pigment .. 2											
Fibrocellular .. 72											
Cellularity .. 9											
26, 7609, Carcinoma .. 53	57.0										
Necrotic .. 2											
Lymphocytes .. 1		24.35	(a) 1.26		(a) 1.72		(a) 0.114		(a) 1.79		
Fat cells .. 5			(b) 3.7	1.06	(b) 5.0	1.28	(b) 0.33	0.082	(b) 5.2	2.25	6.7
Fibrocellular .. 40											
Cellularity .. 7											
11b, 7201, Carcinoma .. 35	41.5										
Necrotic .. 1.5		20.7	(a) 1.97		(a) 2.27		(a) 0.267		(a) 1.97		
Lymphocytes .. 1.5			(b) 9.5	2.7	(b) 11.0	2.8	(b) 1.29	0.32	(b) 9.5	4.1	12.2
Fat cells .. 2											
Fibrocellular .. 60											
Cellularity .. 8											
30, Lymph gland carcinoma .. 10	65.5										
Lymphocytes .. 2		16.08	(a) 2.17		(a) 2.6		(a) 0.145		(a) 12.24		
Fat cells .. 84			(b) 13.5	3.86	(b) 16.2	5.1	(b) 0.89	0.36	(b) 13.9	6.0	15.85
Fibrocellular .. 10											
Altered breast tissue .. 30											
Cellularity .. 8											
15, 7281, Carcinoma .. 30	32.0										
Lymphocytes .. 1		19.3	(a) 1.71		(a) 2.07		(a) 0.17		(a) 1.74		
Fat cells .. 5			(b) 8.95	2.55	(b) 12.5	3.2	(b) 0.89	0.22	(b) 8.9	3.8	11.95
Fibrocellular .. 65											
Cellularity .. 1.7											
18, 7381, Carcinoma .. 33	45.0										
Lymphocytes .. 2		19.4	(a) 1.61		(a) 3.18		(a) 0.37		(a) 2.03		
Fat cells .. 5			(b) 8.3	2.37	(b) 16.4	4.2	(b) 1.9	0.475	(b) 10.6	4.6	
Fibrocellular .. 60											
Cellularity .. 1.7											
11a, Lymph gland carcinoma .. 25	30.0										
Necrotic .. 1		19.35	(a) 1.95		(a) 2.3		(a) 0.51		(a) 1.57		
Lymphocytes .. 1			(b) 10.1	2.9	(b) 11.9	3.05	(b) 2.64	0.66	(b) 8.1	3.5	12.8
Fat cells .. 7											
Fibrocellular .. 65											
Cellularity .. 5											
8, 7174, Carcinoma .. 35	47.0										
Lymphocytes .. 8		20.8	(a) 2.45								
Fat cells .. 15			(b) 11.8	3.4							11.31
Fibrocellular .. 42											
Cellularity .. 8											

¹The figures in the several columns marked (a) and (b) represent milligrammes per gramme, estimated on (a) wet weight, (b) dry weight.

²M.C. = Molecular Concentration. ³Cellularity = Percentage of fibrocellular tissue which is cellular.

TABLE II.—Continued.

Specimen.	Percentage of Whole Tissue which is Cellular.	Percentage Solid.	Chloride.		Potassium.		Calcium.		Sodium.		Nitrogen.
			Weight. ¹	M.C. ²	Weight.	M.C.	Weight.	M.C.	Weight.	M.C.	
5, 7023, Carcinoma living .. 40	53.0	20.25	(a) 2.5								
Necrotic .. 5			(b) 12.35	3.5							
Lymphocytes .. 7											
Fat cells .. 8											
Fibrocellular .. 40											
Cellularity .. 15											
17p, 7333, Carcinoma .. 40	63.0	18.4	(a) 1.68		(a) 3.4		(a) 0.060		(a) 1.40		
Lymphocytes .. 10			(b) 9.15	2.61	(b) 18.5	4.7	(b) 0.37	0.002	(b) 8.1	3.5	13.65
Fat cells .. 30											
Fibrocellular .. 50											
Cellularity .. 25											
17, Secondary growth ..											
Lymph gland ..											
Carcinoma, 78 ..	82.0	18.55	(a) 1.36		(a) 3.53		(a) 0.058		(a) 0.88		
average ..			(b) 7.3	2.1	(b) 10.0	4.9	(b) 0.31	0.077	(b) 4.7	2.04	13.84
Lymphocytes, 2 ..											
Fat cells, 1 ..											
Fibrocellular .. 10											
Cellularity .. 12.5											
10, 7188, Carcinoma .. 25	28.5	10.0	(a) 2.32		(a) 2.31		(a) 0.728		(a) 1.98		
Necrotic .. 30			(b) 12.2	3.5	(b) 23.15	3.8	(b) 3.8	0.05	(b) 10.4	4.5	12.8
Lymphocytes .. 1											
Fat cells .. 2											
Fibrocellular .. 42											
Cellularity .. 6											
26a, Carcinoma—	80.0	21.3	(a) 2.05								
A .. 70			(b) 9.6	2.74							14.42
C .. 61											
Necrotic—											
A .. 10											
C .. 9											
Lymphoid tissue—											
A .. 8											
B .. 80											
C .. 18											
Fat Cells—											
A .. 1											
C .. 1											
Fibrocellular—											
A .. 11											
B .. 20											
C .. 11											
Cellularity .. 12											
25a, Lymph gland .. 12	14.7		(a) 2.75		(a) 1.32		(a) 0.16		(a) 12.24		
No pathological examination			(b) 18.7	5.3	(b) 9.0	2.3	(b) 1.00	0.275	(b) 15.2	6.6	(b) 11.60

¹The figures in the several columns marked (a) and (b) represent milligrammes per gramme, estimated on (a) wet weight, (b) dry weight.²M.C. = Molecular Concentration. ³Cellularity = Percentage of fibrocellular tissue which is cellular.TABLE III.
Normal Breast Tissue.

Specimen.	Percentage Solid.	Chloride.		Potassium.		Calcium.		Sodium.		Nitrogen.
		Weight. ¹	M.C. ²	Weight.	M.C.	Weight.	M.C.	Weight.	M.C.	
Normal breast tissue 15	24.83	(a) 2.22		(a) 1.30		(a) 0.096		(a) 1.71		
		(b) 8.94	2.55	(b) 5.6	1.43	(b) 0.387	0.097	(b) 6.9	3.0	9.34
Normal breast 16	19.6	(a) 2.61		(a) 1.73		(a) 0.35		(a) 1.69		
		(b) 13.2	3.8	(b) 8.8	2.26	(b) 1.79	0.45	(b) 8.6	3.7	13.8
Normal breast 17	22.95	(a) 2.85		(a) 0.715		(a) 0.159		(a) 2.7		
		(b) 12.4	3.55	(b) 3.1	0.80	(b) 0.60	0.172	(b) 10.4	4.5	13.85

¹The figures in the several columns marked (a) and (b) represent milligrammes per gramme, estimated on (a) wet weight, (b) dry weight.²M.C. = Molecular Concentration.

For the method of chemical analysis of all the elements except nitrogen see "Mineral Content of the Developing Avian Embryo".⁽⁹⁾

Mr. Bishop, M.Sc., is responsible for the estimations of nitrogen, which were done by the Kjeldahl method.

Discussion.

Curves have been plotted from the results obtained, with a view to finding some relationship between mineral content and carcinoma content of the tissue. If one plots a curve from the results

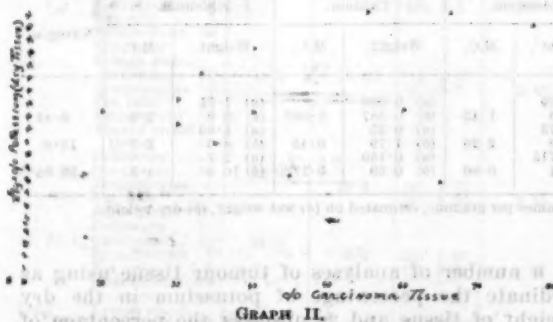
of a number of analyses of tumour tissue using as ordinate the percentage of potassium in the dry weight of tissue and as abscissa the percentage of cellular tissue, a curve of a definite shape is obtained (Graph I). If the potassium is contained mainly in the cells of the tissue and is equally distributed between neoplastic and non-neoplastic cells, then a curve plotted using x as the abscissa and the $\frac{x}{x+y}$ of the percentage of potassium contained in the dry weight of the tissue, as ordin-

ate, where x = percentage of total cells which are neoplastic, and y = percentage of total cells which are not neoplastic, then a curve similar in shape to that of Graph I should be obtained (Graph II). On comparing Graphs I and II we see that this is the case. We also see that increased cellularity in general is accompanied by increased potassium content, which substantiates the view that potassium is contained mainly in the cells of the tissue.



GRAPH I.

On the other hand Graphs III and IV, which are of similar type to Graphs I and II, do suggest very strongly that there is an increased concentration of nitrogen in the tumour cells; the possibility of an increase in fibro-cellular material being associated with an increase in tumour cells, and thus raising the nitrogen content has been considered and found not to interfere with the deduction. There is a tendency for the more rapidly growing tumours to have a higher concentration of potassium than the more slowly growing ones. However, on reference to the total cellular content of these it is seen that the more rapidly growing tumours are generally more cellular than the more slowly growing ones, and therefore the increase in potassium is most probably caused by the



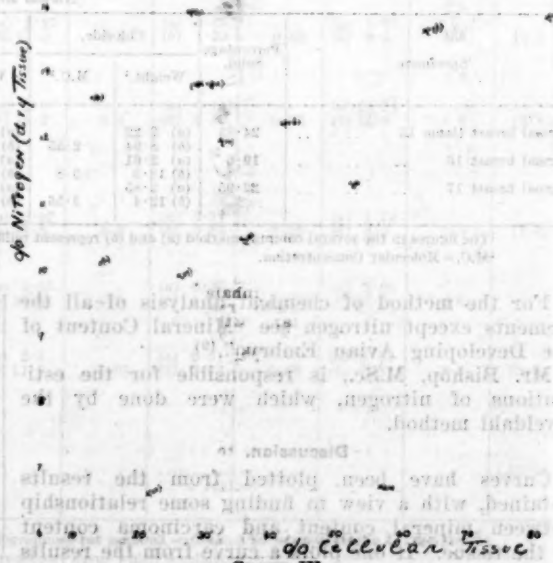
GRAPH II.

increase in cellular content. In Table II are the analyses of three normal breast tissues; these are shown to contain a lower concentration of potassium than the corresponding tumour tissue which arose from them. Unfortunately, no specimens were submitted for pathological examination, so that the above criticism (that is of total cellularity) holds here also.



GRAPH III.

Further examination of the results shows that there is a big variation in the mineral content of individual tumours of different types (see Table



GRAPH IV.

I), and of the same type (see Table II). The solid content of tumours of the same type varies from 12% to 34%, which is not a smaller variation than that found in the tumours examined of very different types. In the series of breast tumours it is found that the sodium and chloride content are approximately the same in individual cases. However, the molar concentration shows an excess sodium in nearly every case, which suggests that sodium is present as some other salt in addition to sodium chloride.

The special pathological characteristics of the various specimens will presently be briefly described. Two specimens in particular have behaved differently from the rest of the series, as regards the relation of proportion of carcinoma to proportion of potassium and nitrogen present. These are tumours Numbers 35 and 26.

Both of these contain a much lower proportion of potassium and nitrogen than might be expected from a comparison with the other specimens.

Tumour 35 shows a fairly high proportion of vigorous and actively growing carcinoma tissue, but as both newgrowth and stroma have undergone extensive colloid (muroid) degeneration the greater part of the specimen is composed of colloid (muroid) material only. As this material replaces nearly the whole of the stroma, which in the other specimens is represented by a more or less vascular fibrous or fibro-cellular tissue, it is possible that the low proportion of actual living tissue present may account for the unusually low figures obtained for potassium.

Tumour 26 shows a very marked variation in the types of carcinoma present, scirrhus, encephaloid, and adenocarcinoma being found in the same section.

While neither neoplasm nor stroma shows any degeneration or much necrosis, it is possible that even more variation may have occurred in other parts of the specimen. There is nothing, however, beyond the unusual variety of form seen in the sections examined, to account for the unusually low content of potassium and nitrogen.

With regard to chloride, sodium and calcium, no such marked variation in chemical content is shown by the above two specimens.

Summary of Description of Specimens Examined Microscopically.

I.—Breast Series.

The specimens arranged approximately in order of increasing rate of growth:

Tumour 4, 7005, small nodule from breast. The small fragment of tissue submitted shows an adenoma, which is not malignant, but yet is nearer a carcinomatous development than is usual in an adenoma of the breast. The stroma is fibro-cellular where the epithelial newgrowth is most active, elsewhere densely fibrous. The growth is not cancer.

Tumour 6, 7036, tissue from breast. The newgrowth is a scirrhus carcinoma. A few large cell masses are seen, but for the most part they are small and widely scattered, many cells even lying singly. There are also groups of

acini, which appear to be in a pre-carcinomatous condition. The stroma for the most part is dense and fibrous. Very few lymphocytes are present.

Tumour 14, 7258, tissue from breast. Scirrhus carcinoma. The greater part of the specimen consists of aggregations of fat cells, among which run branching strands of dense fibro-cellular tissue. In the latter are scattered the small cell masses of the carcinoma. In places these cell masses are closely grouped in large numbers, and there the stroma is loose and scanty. In other places the cell masses are fewer and more widely separated by a dense fibrous tissue. Lymphocytic reaction is very well marked.

Tumour 27, 7656, tissue from breast. Scirrhus carcinoma. The structure varies from fairly large cell masses with a loose cellular stroma, to very small masses and isolated cells scattered in a dense fibrous stroma. Invasion of the adjoining adipose tissue is conspicuous. Numerous clumps of lymphocytes are present.

Tumour 28, 7684, tissue from breast. Scirrhus carcinoma. The cell masses are of moderate size and lie in a dense fibro-cellular stroma. Surrounding many groups of the cell masses the connective tissue is denser, more fibrous, and less cellular. Lymphocytic reaction is very slight. There are some areas of the original breast tissue which show what appears to be a fibro-adenomatous change with, in parts, invasion by the carcinoma.

Tumour 29, 7607, tissue from breast. An alveolar carcinoma of the soft scirrhus type. Invasion of the lymphatics is a marked feature. The stroma is dense and fibrous, and very little lymphocytic reaction is seen.

Tumour 15, 7281, tissue from breast. Scirrhus carcinoma. The cell masses vary in size, but are separated and surrounded by a dense fibrous stroma which in parts is undergoing myxomatous degeneration. Lymphocytic reaction is very scanty.

Tumour 18, 7381, tissue from breast. Carcinoma of breast, which is of the scirrhus type, but, though the cell masses of the carcinoma are typically small, yet they are so closely grouped that quite one-third of the tissue consists of cancer cells. Stroma is compact and fibro-cellular.

Tumour 11a, 7201, axillary lymph glands. The primary growth is a scirrhus carcinoma of the breast (Tumour 11b). The glands show invasion by an alveolar carcinoma. The carcinoma cell masses are for the most part smaller than those in the primary growth, many of the cells lying in twos and threes and even singly. The stroma is on the whole denser than in the primary growth, but it varies in degree of cellularity. Very little of the original lymphoid tissue is left.

Tumour 8, 7174, "cancer with portions of fatty tissue". An alveolar carcinoma in which the cell masses vary considerably in size. A few of them show necrosis. The stroma is fibro-cellular, with some denser fibrous areas. Lymphocytic reaction is well marked.

Tumour 5, 7023, tissue from breast. Scirrhus carcinoma. The cell masses of the carcinoma show considerable variation in size. In parts they are small and widely scattered, in others larger and more numerous. In other parts again there is a definite tendency towards the encephaloid type of growth, large cell masses showing necrosis in their centres. The stroma also varies, from loose and fibro-cellular to densely fibrous tissue. Lymphocytic reaction is marked, and numerous dense aggregations of lymphocytes are present.

Tumour 24, 7590, tissue from breast. Adenocarcinoma. The carcinoma cells are small and almost cubical; the lumina are well developed and the majority are single. The stroma is abundant, loose and cellular, and shows myxomatous characteristics in different degrees. The appearance suggests that this specimen occupies rather a lower place in the scale of malignancy than most types of adenocarcinoma.

Tumour 35, 7775, tissue from breast. Colloid carcinoma. The cell masses are compact and well defined. They show

considerable variation in size, and are composed of large irregular spheroidal cells with clearly staining round or oval nuclei. The stroma is abundant. Extensive colloid (mucoid) degeneration has taken place and has involved the marginal cells of most of the carcinoma cell masses and in some places the whole of the cell masses; it has also involved almost the whole of the connective tissue and blood vessels of the stroma. A few strands of dense fibrous tissue and a few small blood vessels with more or less imperfect walls intersect both the carcinoma tissue and the colloid (mucoid) material, and these represent all that is left of the original stroma. A few patches of old blood clot are present. Lymphocytic reaction is not observed. Thus, almost the whole of the specimen consists of masses of living carcinoma cells lying in a matrix of colloid (mucoid) material.

Tumour 16, 7307, tissue from breast. This is a recurrent newgrowth and has been treated by X rays. Alveolar carcinoma, varying from soft scirrhus to encephaloid type. In some parts the cell masses are large, with central areas of necrosis; their peripheral margins are ragged and irregular, with prolongations into the surrounding fibrous tissue. The appearance suggests that some necrotic areas are being occupied by ingrowths of fibro-cellular tissue. In other parts the cell masses are smaller and more widely scattered. The stroma, which is immediately surrounding the individual cell masses, is rather loose and fibro-cellular, but the tissue which surrounds the larger aggregates of cell masses is denser, more fibrous and less cellular. Lymphocytic reaction is extremely scanty. Patches of blood pigment lie in the denser connective tissue, and within many of these patches there are groups of carcinoma cells some of which contain pigment.

Tumour 26, 7609, tissue from breast (compare Tumour 26a). Glandular carcinoma, showing three distinct types of growth. (i) The peripheral part of the growth shows scirrhus or soft scirrhus characteristics. The cell masses are numerous, rather small and separated by a fibrous but scanty stroma. In places there is a well marked lymphocytic reaction, and invasion of the surrounding fat by the carcinoma cells can be seen. (ii) In a deeper part of the tumour the cell masses are larger and more widely separated by a dense poorly cellular fibrous stroma. They tend rather to the adenocarcinomatous type of growth, with formation of imperfect and irregular lumina. (iii) Towards the centre of the tumour the encephaloid type is found—large cell masses with necrotic centres. The stroma is highly cellular. Considerable variation in composition throughout the specimen may be expected.

Tumour 11b, 7201, tissue from breast (compare Tumour 11a). Scirrhus carcinoma with some tendency to encephaloid type. Towards the margin of the growth the cell masses are small, compact and numerous, with a loose fibro-cellular stroma which in parts is almost myxomatous. In other regions the cell masses are larger, with necrotic centres. In still other parts the carcinoma cell masses are again small, but are widely separated by a denser and more fibrous stroma. Lymphocytic reaction is moderate only. Invasion of both fat and fibrous tissue is marked.

Tumour 30, 7695, axillary lymph glands. Primary growth is a scirrhus carcinoma of the breast. Invasion by large cell masses of carcinoma, some of which show necrosis. Stroma is compact and fibro-cellular. Scattered areas of lymphoid tissue remain.

Tumour 17P, 7333, tissue from breast, with skin involved by growth. Carcinoma of breast which presents two different phases and two different forms of the carcinoma, in the primary growth and in the metastases. The growth involving the skin (Tumour 17P) is a typical adenocarcinoma of the type more often seen growing from the large intestine. The stroma is fibro-cellular, and there is a very marked lymphocytic reaction at the margins of the newgrowth. The axillary lymph glands (Tumour 17S) are very heavily invaded by continuous cell masses of carcinoma which, however, do not reproduce an adenocarcinomatous formation, but simply form continuous closely

packed masses of cancer cells, so that a very high proportion of the gland substance is composed of cancerous tissue. Very little of the original lymphoid tissue is left.

Tumour 17S, 7333, axillary lymph glands, from the same case as Tumour 17P, and described under the same heading.

Tumour 10, 7188, cervical lymph glands. One large gland shows heavy invasion by cell masses of an alveolar carcinoma. Hardly any of the original lymphoid tissue remains, only occasional areas around the periphery being seen. The central part is occupied by large areas of necrosis, bounded by the cell masses of the carcinoma. The fibro-cellular stroma is dense in some parts and looser in others, but nowhere is it highly cellular.

Tumour 26a, 7609, axillary lymph glands. Primary is carcinoma of breast (Tumour 26). The glands are invaded by very large carcinoma cell masses, which show central necrosis. There is a rather scanty fibro-cellular stroma. Surrounded by the large cell masses and separated from them by narrow strands of fibro-cellular tissue are the remnants of the lymphoid tissue, very little of which is left.

II.—Miscellaneous Specimens.

Tumour 9, 7173, tissue from uterus. An alveolar carcinoma. At the advancing margin the cell masses are small and compact, but in the more superficial parts the masses are larger and more broken, with areas of necrosis. The stroma is fibro-cellular. Lymphocytic reaction is fairly well marked round the advancing margin of the growth. Some isolated cell masses of the carcinoma have invaded the muscular wall more deeply.

Tumour 20, 7387, inguinal lymph glands. The patient had an epithelioma of the oesophagus, which was treated by radium six months previous to the excision of the glands. The glands had developed clinically during the last three months. The lymph glands are extensively invaded by large cell masses of squamous cell carcinoma of the transitional mucosal type, probably secondary to the growth in the oesophagus.

Tumour 12, 7262, lymph glands, cervical. There is invasion by the cell masses of a squamous cell carcinoma, with well-marked cell nest formation. Some of the larger cell masses show areas of necrosis. The stroma is abundant, loose and fibro-cellular. Nearly half of the original lymphoid tissue is present.

Tumour 34, 7724, spontaneous superficial growth from abdomen of mouse. The structure resembles that of an angio-endothelioma. The neoplastic cells are plump and of endothelial type. They form numerous small tubes lying in a fibro-cellular stroma. An adjoining region shows several large dilated lumina, lined by flattened endothelial cells and distended with blood.

Tumour O.T. I, 7093, growth removed from an ox. A typical squamous epithelioma, showing cell nests, scanty fibro-cellular stroma and some formation of keratin.

Tumour O.T. II, 7095, growth removed from an ox. The growth consists of small round cells, which are invading and breaking up a region of dense fibrous tissue. The general appearance is that of a sarcoma, possibly a lymphosarcoma.

Tumour 19, 7380, growth from interior of chest of sheep. No metastasis. This appears to be some form of lymphoid growth, its substance being made up chiefly of small round cells (probably lymphocytes) closely packed together. The tissue therefore has a high content of nuclear matter. The growth is probably some form of lymphoma or lymphosarcoma.

Tumour 23, 7504, growth from mouse experimentally inoculated with sarcoma 37C. The tissue consists almost entirely of very large masses of sarcoma cells. A large proportion of these are necrotic. A few bands of loose fibro-cellular tissue with thin-walled blood vessels are present among the sarcoma cells.

Acknowledgements.

We wish to express our thanks to Professor Priestley, of the Department of Physiology, and to Professor D. A. Welsh, of the Department of Pathology, of the University of Sydney, and Dr. H. G. Chapman, Director of Cancer Research, for their helpful criticism and advice.

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Reports of Cases.

A CASE OF ANGIO-ENDOTHELIOMA IN A CHILD DUE TO INJURY SUPERADDED TO SUNBURN.

By SYLVIA BRAY, M.B., B.S. (Sydney),
Radium Registrar, Sydney Hospital.

J.C., A SCHOOLBOY, aged seven years, was seen by the late Dr. G. Hamilton at the Radium Clinic, Sydney Hospital, on March 16, 1932, with two large tumours on the left shoulder.

Five weeks previously he had been severely sunburned whilst bathing and playing on the beach. His neck, back, shoulders and arms were badly blistered. A fortnight afterwards, at school, a boy struck him on the left shoulder over a blistered area, and within a fortnight he had two raised soft "lumps" on this area of the shoulder. His mother applied bluestone five times in the last two and a half days.

When he was seen by Dr. Hamilton there were two lesions on the left shoulder over the lateral half of the clavicle. The medial one was 3.75 centimetres (one and a half inches) long by 15 millimetres (five-eighths of an inch) wide and raised 1.25 centimetres (half an inch), and the lateral one was 1.25 centimetres (half an inch) in diameter and eight millimetres (one-third of an inch) long. Both were red, very soft and friable, had a circumscribed basal margin, and the surface was ulcerated. Both were movable on the underlying tissues. The boy was a sandy red haired child with many freckles, blister marks all over his shoulders, back of his neck, arms and the upper part of the chest and back.

Both lesions were shaved off level with the skin and a radium plaque was applied to each. The larger lesion had a varnished, half-strength, sixty-milligramme plaque, without a screen, for two hours on March 17, 1932, and two hours on March 18, 1932. The smaller one had a half-strength thirty-milligramme plaque, without a screen, for the same time.

The pathological report on the specimens was as follows:

The specimens consist of shavings from the lesion. They are composed mainly of granulation tissue in which leucocytes are abundant. Here and there are collections of cells which appear to be neoplastic. So far as an opinion can be formed from this speci-

men, the appearances suggest angio-endothelioma. These growths tend to recur locally, but usually do not metastasize.

The usual reaction followed the radium treatment and at the end of two months the lesions were quite healed and have remained healed ever since.

Reviews.

STREPTOCOCCI.

THE science of bacteriology has made very great advances in the last two decades. The number of workers in this field has become very large and the literature has increased proportionately. This increase in the mass of work being performed has brought about the necessary publication of monographs on special aspects of the subject. One of the most recent and important publications of this nature is entitled "Streptococci in Relation to Man" and is written by Anna W. Williams who has devoted many years to the study of the genus *Streptococcus*.

The aim of the monograph has been to summarize the present knowledge regarding the protean activities of streptococci, particularly in relationship to man, and to indicate to what extent this knowledge is capable of practical application. This task is successfully accomplished in twelve chapters. Two chapters are devoted to early work and classification. Other chapters deal with local infections, elective localization, immunity and streptococci in relationship to special diseases such as erysipelas, scarlet fever, rheumatic fever and so on. Attention is also given to a summary of technical methods used by the author and others. A comprehensive bibliography is provided at the end of the book.

The subject is dealt with in a concise manner and a vast amount of information is made available in a very readable form. The book is printed in America. Numerous typographical errors occur throughout, but more particularly in the first part of the book.

The work will form an indispensable reference book to pathologists, bacteriologists and public health workers.

COLDS AND HAY FEVER.

"COLDS AND HAY FEVER" is the title to a further addition to the Minor Monograph Series, which by now covers a wide range of medical subjects.¹ Written in attractive style by such an authority as Frank Coke the subject matter must compel attention.

Following a chapter on nasal functions there is a constructive consideration of the etiology and likely bacterial agents which cause the common cold; thence hay fever, sneezing, paroxysmal rhinitis and chronic nasal catarrh receive attention in precise and clear description. Allergic factors are very largely stressed and while relief from desensitizing measures is described, nevertheless one is left impressed that of major import in many instances is avoidance of the exciting irritants when that is possible. Yet how often is this impossible, except in the case of those few who can abandon their occupation and flee before the seasonal pollen invasion overtakes them.

Many an enthusiastic practitioner, however, will no doubt be anxious or sorely pressed to find relief for sufferers from these irritating complaints. To such this little book will fill a need, in supplying encouragement to embark upon a patient search for offending antigens and in providing a basis upon which to build a routine for investigation and management of his case.

To the doctor who would keep abreast of the times in a broad understanding of these conditions, here is a text of

¹ "Streptococci in Relation to Man in Health and Disease", by A. W. Williams, M.D.; 1932. London: Baillière, Tindall and Cox. Royal 8vo., pp. 272, with 8 plates. Price: 29s. net.

² "Minor Monograph Series: Colds and Hay Fever", by F. Coke, F.R.C.S.; 1933. London: Baillière, Tindall and Cox. Crown 8vo., pp. 158. Price: 5s. net.

easy reading, authoritatively written and fully supported with a series of references to the originators and supporters of the claims appearing upon the pages as alphabetically indexed.

GASTRO-ENTEROLOGY.

DR. M. A. ARAFA has added no mean contribution to the literature on gastro-enterology. His "Modern Aspects of Gastro-Enterology" represents the cream of the knowledge skimmed by him from the medical clinics of Europe and the literature of America.¹

Dr. Arafa, who holds an appointment on the staff of the Egyptian University, was given three years leave of absence to study abroad. During this time he took the opportunity of studying the subject of gastro-enterology under the leading masters of the subject in Germany, Austria and England. He is obviously deeply impressed with the work of Hurst, of Guy's Hospital, London, and indeed acknowledges his debt to this investigator.

Dr. Arafa has produced a very readable and complete exposition of the subject, and has attempted to give the reader the latest and what he considers the best information in methods of examination, diagnosis and treatment of the diseases of the stomach, intestines and digestive glands. He deals with each organ in a thorough and business-like fashion, making full use of very fine illustrations almost all of which are original. The reproduction of X ray films is well done, and the coloured plates representing the sigmoidoscopic appearances of the different colonic diseases are exceptionally good. All phases of treatment are thoroughly dealt with.

The book is of the greatest value and can be warmly recommended to practitioners who are desirous of acquiring a knowledge of the latest developments in the study of gastro-enterology. Both Dr. Arafa and the Egyptian University are to be congratulated.

THE MENSTRUAL CYCLE.

"WOMAN'S PERIODICITY", by Mary Chadwick, is a short work dealing with the physiological and psychological disturbances which arise during the different phases of the menstrual cycle.² The authoress is not a member of the medical profession; she is a nurse who has studied modern psychology and practises as a lay psychoanalyst in London.

Section 1 of the volume gives a very brief survey of the beliefs and customs of primitive man regarding the menstrual function and some of the medical theories held about the function in ancient times.

Section 2 deals with many physiological and psychological disturbances which occur in both sexes during childhood and which become more pronounced at the onset of puberty.

The third section comprises the main portion of the book, and here the authoress gives a fairly comprehensive account of the many different ways in which the menstrual cycle of the female affects not only the woman herself, but all those in her immediate environment—husband, children, domestic staff *et cetera*.

The physical and psychological relationships and interactions of the forces acting through the female personality and those around her are traced and developed in some detail. The dangers which may result from ignorance of the true cause of these disturbances are pointed out, and finally some account of the mental disorders of the menopause is given.

The book contains much interesting matter, but it suffers, like most books of its kind do, from an attempt to impart too much information in too small a space. The work is in consequence somewhat scrappy, and in places it is difficult to follow exactly the sequence of the argument. For instance, the authoress has in two parts

of the book introduced the subject of witchcraft and its relationship or descent from mother goddess worship; she then endeavours to show that men reacted violently to witchcraft and to witches because the mother had become repugnant to the male child on account of the smell associated with menstrual flux, and because the son always conceived of the mother as having some secret of a valuable nature relating to this activity of the sexual apparatus.

The argument developed upon this aspect of the subject is not complete enough to carry conviction, and its connexion with the remaining portions of the work is therefore not very obvious.

In our opinion the most instructive argument in the whole book is that in which is developed the theme that the reaction of both male and female to menstruation is due to the castration complex. The original idea of primitive man as well as of every child is that both sexes are primarily alike physically, but that owing to some crime the female has suffered an injury—a castration. The onset of menstruation affords evidence that some violence has actually happened to the girl; it may be violence from a supernatural being, an animal or a human.

The appearance of a wound therefore revives in the unconscious the primitive ideas relating to castration; this again has far-reaching psychological connexions deep into the mental life of the individual and the race. A disturbance set up in this complex may in consequence result in thoughts or conduct which are not altogether compatible with the person's ego, and a conflict or psychoneurotic disorder results.

A psychoanalysis of almost any psychoneurotic person will disclose that the castration complex exists, and analyses of females nearly always show that the mental reactions to menstruation revolve around this complex.

The authoress evidently practises as a psychoanalyst and therefore has excellent opportunities of ascertaining the morbid reactions consequent upon the periodic flux in the female organism, but in our opinion, as far as Australian women are concerned, the vast majority suffer little or no psychological disturbance as a result of the waxing and waning of the physiological cycle.

The reactions depicted in the book undoubtedly occur, but rather too great an influence in the causation of these reactions is attributed to the menstrual cycle. Morbid thoughts and actions are the result of many influences in the life of the individual; the periodic tension of the female cycle has some influence in these disturbances, but not as great as that put forward in this book.

The construction of the sentences is rather obscure in parts and the exact meaning difficult to determine, but on the whole the book will repay perusal by medical practitioners.

CLINICAL EXAMINATION IN SURGERY.

In the fourth edition of "Physical Signs in Clinical Surgery", Hamilton Bailey has not added greatly to its predecessor.³ Nor could this be expected, for this book already stood in a class by itself as a companion for the surgical dresser in the wards and the out-patient department. It does not include a detailed account of physical examination, but lays emphasis on the methods of eliciting differential and diagnostic signs in a wide range of conditions. It should be regarded as a supplement to, not a substitute for, such a work as the "Clinical Methods" of Hutchison and Rainey.

One of the most satisfying features in this book is the attempt that is made to give to a physical sign its appropriate anatomical and pathological basis. The illustrations, of the same excellence as in previous editions, have been increased in number. These two features alone render this work, in our opinion, the best of its kind in English that has been offered to students and graduates. The success of this edition will be as assured as that of its predecessors.

¹"Modern Aspects of Gastro-Enterology", by M. A. Arafa, M.R.C.P., with foreword by A. F. Hurst, M.D., F.R.C.P.; 1933. London: Baillière, Tindall and Cox. Royal 8vo., pp. 392, with 56 plates. Price: 27s. 6d. net.

²"Woman's Periodicity", by M. Chadwick, S.R.N.; 1933. London: Noel Douglas. Crown 8vo., pp. 228. Price: 6s. net.

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The Medical Journal of Australia

SATURDAY, NOVEMBER 25, 1933.

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EPITHELIOMA OF THE LIP.

REPORTS on investigations in cancer are as a rule received with eagerness by workers on the subject. The output of papers on cancer is enormous, and much time may be wasted by trying to sift the good grain from the chaff. The good grain is not always easy to recognize, and even among the apparent chaff isolated facts of undoubted value may be hidden. Further, some of what appears to be chaff today may tomorrow change its nature. The chief defect of isolated reports on work in cancer lies in their lack of correlation with work in other centres. Many of those issuing reports, of course, leave to their readers the correlation of their work with that of others; their reports are on that account more difficult to appraise, but perhaps not less valuable. A report on cancer of the skin from the pen of Dr. Gretta M. Thomas has recently been issued by the Ministry of Health of Great Britain.¹ A preface to the report has been written by Sir George Newman, Chief Medical Officer to the Ministry of Health. The report deals with an inquiry undertaken at the instance of the Yorkshire Council of the British Empire Council Campaign,

under the direction of the Faculty of the General Infirmary at Leeds. It deals with 503 cases of epithelioma of the skin treated at the General Infirmary at Leeds during the period 1911 to March, 1931, inclusive. It is divided into three parts; these deal with epithelioma of the lip, epithelioma of the skin and rodent ulcer. The part devoted to epithelioma of the lip will alone be considered at present.

Sir George Newman points out in his preface that one of the objects of the investigation has been to attempt to ascertain whether environmental conditions associated with occupation, other than those already recognized as conducive to skin cancer, are open to suspicion. Dr. Thomas states that there were eighty cases of epithelioma of the lip available for the study of aetiological and predisposing factors. Of this number, 69 were available for study of the results of treatment; that is to say, 69 patients were operated on before the end of 1927, and therefore had completed at least three years since their operation. It must be pointed out that this report has to do with patients treated, as Sir George Newman states, prior to the "common usage of radium". In other words, it indicates the survival rates obtained by operative measures alone. Of the 80 patients, 76 were males and four were females. The average age of the males at the time of operation was 62.6 years and of the females 58.7 years. The youngest patient was 34 and the oldest 84 years of age. In discussing occupation in its relation to aetiology, Dr. Thomas points out that 41 (60%) of the total of 68 patients about whom information was available had an occupation which was chiefly outdoor. She then goes on to discuss pipe smoking in relation to an outdoor life. She quotes Young and Russell regarding smoking by outdoor workers and the opportunities they had some years ago of smoking a clay pipe. After quoting Lane-Claypon's finding that cancer of the lip is as common among non-smokers as among smokers, she concludes that too much importance has been assigned to the rôle played by smoking as an irritant. With this conclusion Australian workers will be in entire agreement. The myth about the pipe and cancer of the lip (particularly

¹"A Report on Cancer of the Skin", by Gretta M. Thomas, M.D., "Reports on Public Health and Medical Subjects", Number 70, Ministry of Health, London: His Majesty's Stationery Office, 1933; pp. 130. Price 2s. net.

the clay pipe, which is practically never seen nowadays) is one that has been repeated by one author after another and copied from one text book to another—it has been repeated so often that people have believed it without question. All that Dr. Thomas has to say about an outdoor life and cancer is that it is not at all certain that weather conditions alone can be "responsible for causing irritation of the lip in particular rather than of exposed parts of the skin in general". Sir George Newman, in his preface, is entirely non-committal on this point. Dr. Thomas describes the preceding lesions in the cases under review: wart or warty growth; "spot", pimple or nodule; crack or fissure; bleb, scab or sore; previous injury. Her general conclusion is that nothing of importance emerges from a study of preceding lesions or other ætiological factors. However, the observations made in Australia and elsewhere on the action of sunlight on the skin and mucous membranes justify the acceptance of ultra-violet solar radiation as one of the factors likely to give rise to cancerous change.

The results of treatment in the cases discussed, when treatment was undertaken before the glands were involved, are regarded by Dr. Thomas as very satisfactory and are held to compare favourably with those for cancer of other sites. She states that removal of the glands at the same time as the growth gives a very good result in early cases—there is a net survival rate of 87.5% at three years, 80% at five years, and 60% at ten years. When local excision only is adopted her figures are: 71.4% at three years, 66.6% at five years, and 50% at ten years.

As far as the section of this report dealing with epithelioma of the lip is concerned, it must be regarded as a record of successful surgical operations and as nothing more. Unless those who read the report regard it in this way only, it is likely to retard rather than aid progress. (Sir George Newman states that it is beyond dispute that progress is being made.) Those who are skilled in the use of radium hold that when radium alone is used for early epithelioma of the lip (the lip only, and not the tongue) cure results in 80% of cases without there being any need for interference with

the gland-bearing area. This emphasizes the need for correlation of results of different methods: radium has been used sufficiently long for definite statements to be made as to its value.

Current Comment.

ELECTROCARDIOGRAPHY OF THE DYING HEART.

ON a number of occasions it has been possible to obtain electrocardiographic tracings of the heart at the moment of death. One of these is recorded in a brief article by R. L. Hamilton and H. Robertson.¹ As they remark, electrocardiograms taken during an anginal attack are comparatively rare, but those taken during the lethal termination of such a seizure are extremely rare. Some interest has been aroused lately in the electrical activities of the heart muscle during attacks of angina, for the old debate concerning the origin of anginal pain is by no means a played-out topic. Whether all anginal pain is due to cardiac ischæmia has perhaps not been settled authoritatively. There is still something to be said for the view championed by Allbutt, that the site of the painful stimulus is the aorta, in some few cases at least. Possibly there may be a small group of cases separated from the true coronary type in which the cause is aortic, but, after all, the most important information that the clinician can possess about the heart is a knowledge of the integrity or otherwise of its blood supply. Therefore, quite apart from the question of aortic disease, in clinical states giving rise to anginal pain any information that can be gained concerning the nutrition of the myocardium must be regarded as vital in the matter of treatment and prognosis. Modern electrocardiographic studies are centred around this question of circulatory disturbances of the heart. One of the most striking diagnostic advances of recent times as regards cardiology is in the recognition of cardiac infarction as a clinical syndrome. The next advance will probably be in the direction of more accurate recognition of the effects of progressive coronary sclerosis, for while the morbid anatomist has for many years demonstrated the results to the cardiac muscle of slow starvation, the clinician has lacked any accurately calibrated method of evaluating these changes during life.

Hamilton and Robertson have found in their study, as others have noted, that clinical death and the cessation of cardiac function are not synonymous. Moreover, they were able to demonstrate that heart sounds could be heard at one period although the ventricles were fibrillating. Several anginal attacks were observed in their patient, and more or less complete records of the electrical changes in the heart were obtained during

¹ The Canadian Medical Association Journal, August, 1933.

these. The most diverse types of arrhythmia were observed in these records, auricular fibrillation, impure flutter, extrasystolic contractions, and ventricular fibrillation. After one severe attack had been studied, the patient being apparently relieved by inhalation of amyl nitrite, the pain unexpectedly returned with renewed urgency, and the man, aged forty-nine years, died actually while the film was being exposed. The successive changes visualized in the electrocardiogram during the man's last moments were, in order, cessation of auricular function, disturbance of the ventricular complexes, extreme irritability of the ventricular muscle, culminating in fibrillation, which proved the actual final cause of death. Adrenaline was injected into the heart, but, although a few small waves reappeared on the tracing, this effect was only transitory, and shortly afterwards all signs of cardiac muscular activity disappeared. It is at this stage, when clinical death seems to have taken place, but before irrevocable physiological and chemical changes have occurred, that recovery has followed the use of adrenaline in other cases. This knowledge is, of course, quite old now, but too much emphasis cannot be laid on its importance, for not a few lives have been saved thereby, for example, during general anaesthesia. In this case autopsy showed that there was serious arterial disease in the heart, and ample cause for death was found. At the same time there was no evidence of any infarction of the heart. The authors do not state definitely whether histological examination revealed any nutritional disturbance of lesser grade than actual infarction, but the coronary arteries were sclerosed, particularly the anterior in its descending branch. No other disease was found in any organ, and tests of the blood serum carried out during life gave rise to no suspicion of syphilis. There was a moderate degree of general arterial thickening, but, as is generally recognized, this gives no help in estimating the arterial changes in special organs, such as the heart and brain. Two other points in this patient's history are worth mentioning. First, he had complained of breathlessness on exertion for two years, and there had been no very suggestive findings observed in his circulatory system. Secondly, he had suffered a good deal of digestive disturbance, and on one occasion during an attack of pain his condition was such that his physician believed him to be the subject of an acute gall-bladder colic. The analogy that this bears to the frequently observed simulation of acute abdominal disease by an actual acute coronary occlusion is evident.

Careful and interesting though this study may be, it yet presents the same familiar difficulty, that of knowing just why a patient died. No evidence is forthcoming as to why this man died in the last recorded attack; there was no acute accident demonstrable. This appears to be beyond us; but while it is often hard to explain the varied mechanism of death and to understand the exact reason for the loosing of the silver cord, we are at

least becoming more apt in the recognition of those morbid changes that are likely to make more imminent that last event that "slits the thin spun life".

CHOREA.

AMONG the problems associated with the study of rheumatism, perhaps the most interesting and not the least important is the possibility that chorea may have a non-rheumatic origin. This possibility has been brought up in a recent study by H. L. Wallace.¹ Wallace has examined the records of over 219 patients suffering from chorea. Of these, 159 were females and 60 were males. The average age for females was 13.4 years, and for males 11.7. In 39 out of 208 of the total cases (18.7%) a family history of rheumatism was elicited. Among 215 of the total number, 98, or 45.6%, gave a history of having suffered from previous rheumatic disease, excluding chorea. In 40 cases (18.6%) a history of a previous attack of chorea was obtained. In 15 of 215 cases the choreic attack dated from a non-rheumatic illness. In six instances it followed scarlet fever, in four diphtheria, in two influenza, in two erysipelas; in one case it was associated with pregnancy. However, in seven of the fifteen cases there was a rheumatic tendency, as evidenced by a history of previous rheumatic disease; in eight cases such a history was absent. In 56 cases (26%) a nervous shock appeared to act as an exciting cause.

Poynton and Schlesinger, in their book, "Recent Advances in the Study of Rheumatism", point out that statistical studies throw little light on the aetiology of chorea, since they are founded on the basis that it is a nervous disorder. They state that the outcome is confused if it is not realized that chorea is the most frequent solitary manifestation of rheumatism. On the other hand, chorea may occur repeatedly without any other symptoms. Although Poynton and Schlesinger state that it is safest to accept chorea as of rheumatic origin, they report having seen cases exactly like chorea in which tuberculous meningitis was found at autopsy. Wollenberg described infectious chorea and differentiated it from degenerative chorea and choreiform conditions. Even if this be allowed, the clinical distinction is not easy to make. Rheumatism can manifest itself as chorea, and the streptococcus is commonly accepted as the causative agent of rheumatism. We must therefore postulate a selective action of the bacterial toxin on certain cerebral cells and/or a susceptibility of those cells. If the streptococcus of rheumatism alone can cause choreic symptoms, the cell susceptibility must always be specific. There is no justification to warrant the assumption that it is. The solution to the question cannot yet be found. When it is found, it is not unlikely that nervous influences, such as shock, will have something to do with susceptibility of cerebral cells to bacterial toxins.

¹ *Edinburgh Medical Journal*, September, 1933.

Abstracts from Current Medical Literature.

DERMATOLOGY.

Acne Rosacea.

S. AYRES AND N. P. ANDERSON (*The Journal of the American Medical Association*, March 4, 1933) describe the results of treatment of *acne rosacea*. *Demodex folliculorum* was demonstrated in the pus or scales of lesions of *acne rosacea* in 77 patients. Treatment consisted in advising the patient to wash thoroughly with soap and water every night and to apply an ointment for three nights as follows: betanaphthol 2 grammes, sublimed sulphur 4 grammes, balsam of Peru 15 grammes, petrolatum 15 grammes. Danish ointment was equally effective and less irritating. Later, the ointment was repeated once or twice a week for several weeks. Temporary increased redness of the face and some desquamation occurred. The improvement in nearly all cases was remarkable. It is possible that *demodex folliculorum* is the cause of the lesions. The demodex is demonstrated by placing some pus from a superficial pustule or a minute dry follicular scale on a glass slide and macerating with a drop of 40% potassium hydroxide or glycerine.

Multiple Gangrene of the Skin.

J. H. T. DAVIES (*The British Journal of Dermatology and Syphilis*, August-September, 1933) reports three cases of gangrene of the skin which had certain features in common. In all three cases the clinical aspect of the eruption at one time or another was strongly suggestive of iododerma. In all three cases bullæ and ulcerative lesions developed out of small and insignificant spots which resembled clinically the essential lesions of papular urticaria. In all three cases the eruption appeared as a complication of a chronic debilitating illness, in two cases chronic colitis with hæmorrhage and anaemia, in the third lymphadenoma. In all three patients, two of whom died, the eruption eventually healed. In two of the cases bullous lesions of the buccal mucosa preceded the development of bullæ on the skin. The author gives a classification of the recorded cases of cutaneous gangrene.

Erythema Nodosum in Childhood.

J. BROCK (*Münchener Medizinische Wochenschrift*, July 14, 1933) writes that, according to a large literature of proven cases from Scandinavian authors, *erythema nodosum* in childhood is an expression of a tuberculous infection in 100% of the cases (a strong positive tuberculin reaction even in the youngest children). It has mainly the significance of a facultative primary exanthema of tuberculosis, since it occurs at the end of the biological incubation period after the hypersensitivity against tuber-

culosis has developed. *Erythema nodosum* efflorescence and a positive intracutaneous or subcutaneous reaction with old tuberculin closely resemble each other in appearance and course; and *erythema nodosum* can be regarded as an autogenous tuberculin reaction (Ernberg). *Erythema nodosum* regularly shows high activity of the tuberculous process. There is a rapid sedimentation rate and in the majority of cases there is X ray proof of tuberculosis from the appearance of the bronchial glands or lung parenchyma or pleura. This is of more diagnostic value than a positive tuberculin reaction, which as such gives no indication of activity. Every *erythema nodosum* in childhood is an expression of a completely fresh tuberculous infection from tubercle bacilli distributed in the neighbourhood.

Autohæmotherapy.

N. BURGESS (*The British Journal of Dermatology and Syphilis*, August-September, 1933) records the clinical results of autohæmotherapy and auto-serotherapy in some diseases of the skin in which allergy is believed to be a factor. Fifty per centum of the patients treated were cured or greatly relieved. The best results were obtained in acute psoriasis and cases of generalized eruptions occurring in patients suffering from chronic varicose dermatitis. A series of experiments was also made to see whether the amount of proteose excreted in those conditions in which sensitization was believed to be present varied from the normal. No alteration was noticeable. On the other hand, 67% of the patients with skin diseases gave positive skin reactions to their own proteoses, while only 16% of normal persons gave positive reactions. All patients who were relieved by auto-hæmotherapy gave positive skin reactions prior to treatment, while after treatment and relief no reactions were obtained. Those patients who were not relieved continued to give positive reactions. It is suggested that the blood in these patients contains antigens and that the infection of blood or serum therefore leads to desensitization.

Extragenital Infection with the Virus of Lymphogranuloma Inguinale.

W. CURTH (*Archives of Dermatology and Syphilology*, September, 1933) describes a case of lymphogranuloma inguinale occurring on the tip and sides of the tongue, accompanied by a unilateral swelling of the cervical glands. The diagnosis of the condition was confirmed by Frei's test, which is regarded as apparently specific. The pus is obtained from a gland under sterile precautions (preferably a gland which is about to perforate) and diluted with a physiological solution of sodium chloride from four to five times. It is then treated at 60° C. for two hours the first day and one hour the second day. The material is tested for sterility (by aerobic and anaerobic culture)

and then employed as an antigen for an intradermal test. A papule from 0.75 to 1.0 centimetre in diameter appears within forty-eight hours, sometimes surrounded by an erythematous halo in positive cases.

The Irradiation Treatment of Red Birth Marks.

ERNEST KROMAYER (*Urological and Cutaneous Review*, August, 1932) has been treating birth marks by irradiation with Röntgen rays, radium and light rays since 1906. These birth marks may be arterial, capillary or venous in origin. The arterial type is frequently not present at birth, but appears during the first weeks of life, and the treatment of choice, according to the author, is by radium. One course is usually sufficient, but it may have to be repeated at the end of one month. He states that X rays act similarly, though not so effectively as radium. Capillary naevi are usually smooth and flat, and can, as a rule, be destroyed by light from the Kromayer lamp. The author advises in the larger types primary irradiation with the lamp, followed in from two to three weeks by an erythema dose of radium. The venous birth mark arises, however, from the papillary body or from the subcutaneous tissue, and consists of dilated capillaries and veins, and may be: (i) small and superficial, inextensive, and (ii) deeply seated. In the former, surgery, carbon dioxide snow, electrolysis and alcohol, in addition to radium, are used. In the deeply seated types Röntgen rays and radium are given as the methods of choice, and in some cases are the only possible method of treatment.

UROLOGY.

Non-Operative Treatment of Genital Tuberculosis in Males.

A. CASSUTO (*Journal d'Urologie*, April, 1933) pleads for adoption of the method of Durante, of Rome, in the treatment of genital tuberculosis in the male. Epididymectomy or castration is avoided and cure is obtained in nearly all cases by the direct injection of an iodine solution into the affected areas. The method was introduced by Durante as early as 1894, and for nearly forty years has proved reliable in the hands of his pupils. The solution is a slight modification of Lugol's solution. One to two centigrammes of metallic iodine, with the same dose of potassium iodide, are dissolved in one cubic centimetre of distilled water; four to five centigrammes of guaiacol may be added to allay local pain on injection. Durante's original treatment was directed to the epididymis and testis only, but the author adds a recommendation to inject the prostate and seminal vesicles by subcutaneous perineal puncture when these structures are definitely diseased. The injected fluid should infiltrate the affected parts uniformly, but should not "strangle"

them by undue pressure. The good effect is supposed to be due to transudation of serum and emigration of white cells; with succeeding injections the leucocytes acquire the capacity of dissolving the products of caseation and attenuating the activity of tubercle bacilli so that they more easily become prey to micro- and macro-phagocytes. As a rule not more than one to two cubic centimetres of solution are used during each *séance*. The injections are given once to twice a week, according to reaction, and are continued for one to six months, according to results.

Relation between the Renal Glomeruli and Tubules.

L. LOEFFLER (*Zeitschrift für Urologie*, July, 1933) has made histological and embryological studies of the initial portions of the uniferous tubules in man and many animals, and has come to the conclusion that it is only the exception for Bowman's capsule to be directly connected with the beginning of the tubule. The latter typically has a blind closed end, and urine has to undergo two filtrations to pass from blood to tubule.

Argolaval: A Silver Antiseptic.

H. KLINGEN (*Zeitschrift für Urologie*, April, 1933) says that many attempts have been made to find a less irritating silver preparation than the nitrate. The latter, however, has hitherto remained superior to the various compounds of silver with proteins and the colloid silver preparations. The chief advantages possessed by "Argolaval" over silver nitrate are: (i) It coagulates albumin less readily and is therefore less painful; (ii) it possesses greater oxidizing power and is therefore a more powerful antiseptic; (iii) a practical advantage is that "Argolaval" does not stain fabrics or skin. The author's experience was that in average subacute and chronic cases of cystitis a 5% solution of concentrated liquid "Argolaval" in distilled water was the maximum strength advisable. He lays great stress on the necessity of filling the bladder with this solution so that all hollows are unfolded. The solution is best tolerated when only lukewarm, and it should be held by the patient for as long as is comfortable. Treatments may be given daily. For lavage of the renal pelvis in pyelitis the 5% solution of "Argolaval" was found of great value.

Masked and False Renal Tuberculosis.

WOLGENSINGER (*Journal d'Urologie*, April, 1933) discusses cases of *Bacillus coli* infection of the kidneys which mask the presence of a renal tuberculosis, and also another group in which nothing but a *Bacillus coli* or enterococcus infection exists, yet the symptoms resemble those of renal tuberculosis. In the former group the treatment is nephrectomy, whenever that is possible; after nephrectomy the coli-bacillary infection, even if existing in the opposite kidney, usually tends to disappear. Intestinal

disinfection is very strongly advised in order to accelerate the disappearance of the *Bacillus coli* from the urine. In the second group the infection is usually due to enterococci, and here again intestinal disinfection must be attempted, as well as local treatment of the urinary tract; the use of an autogenous vaccine is also of high importance. In both of these atypical groups exact diagnosis is difficult. Urological, radiological and bacteriological studies must be most carefully carried out in order to avoid a mistaken conclusion.

Diverticulum of the Renal Pelvis.

C. A. WELLS (*British Journal of Urology*, September, 1933) describes a case of diverticulum of the renal pelvis in a man aged forty-six years. Diagnosis was made by the accidental finding of a group of shadows in the renal area in a plain X ray film, and was confirmed by stereoscopic retrograde pyelography. At operation the middle third of the anterior surface of the kidney was occupied by a sac containing many small stones. There was a small orifice communicating with one calyx. The kidney was normal in all other respects. The stones were of earthy phosphates, and fluid from the sac was sterile.

Route of Infection of the Kidney.

In a Hunterian lecture, H. P. W. WHITE (*British Journal of Urology*, September, 1933) states that there is ample clinical evidence that renal infections frequently originate in the lower urinary tract or genital organs. By injecting tubercle bacilli or Indian ink into these regions in laboratory animals, a lymphatic communication has been demonstrated experimentally. These lymph channels are found in the periureteral and perivascular tissues, the kidney being entered by way of the loose fat lying outside the calyces, whence there is direct invasion of the adjacent renal parenchyma. It appears that renal involvement from adjacent infected lymph glands is also possible. In these experiments no evidence was found to support the theory that infection may enter *via* the renal papillae. In addition, the author states that he knows of no "sound evidence" that pyelitis can exist at all independently of an infection of the renal cortex.

Bilateral Renal Calculi.

DISCUSSING the treatment of bilateral renal calculi, J. S. JOLY (*Proceedings of the Royal Society of Medicine*, May, 1933) divides his cases into four groups. In the first he places those due to special diatheses (for instance, cystine) in which medical treatment is indicated, except in the presence of obstruction. The second variety are the aseptic calculi. These can usually be removed and the prognosis is good. When the function of one kidney is much worse than that of the other, the bad side is to be operated upon first. Infected calculi constitute the third group. The rule here is to remove first the stones situated lowest

in the urinary tract. When the renal function is approximately equal, stones causing obstruction, particularly if they are capable of removal by pyelolithotomy, are to be operated upon; stones in calyces and staghorn calculi should be left alone. When the renal function is unequal, a functionless kidney should be removed or drained. Small stones may be removed from the good side. If bilateral lithotomy is possible, the better kidney should be treated first. Finally, cases complicated by anuria must be treated first by ureteric catheterization. Should this fail, the more recently obstructed kidney is explored and drainage established. The side on which to operate is determined by the presence of pain and muscular rigidity.

Treatment of Epididymal Tuberculosis.

M. DE LANGRE (*Journal d'Urologie*, May, 1933) says that the results of treatment of tuberculosis of the epididymis are bad because of the associated deep genital and renal lesions as well as pulmonary implication. Therefore it is necessary to associate post-operative medical treatment with the surgical treatment. On the surgical side epididymectomy is the intervention of choice. Castration should be reserved for cases in which the testicle itself is badly invaded. Castration should not be performed on both sides because of the importance of the internal secretion of the testis. In seeking improvement in results in future we must look to our conduct of the post-operative medical treatment.

Dynamics of the Ureter.

W. HECKENBACH (*Zeitschrift für Urologie*, March, 1933) states that in intravenous urography we possess a method which not only has furthered our anatomical knowledge in upper urinary tract diseases, but also sheds light on the living processes in the urinary organs. Those workers who employ compression in order to heighten the clarity of anatomical delineation are interfering with the natural dynamic processes and so are depriving themselves of valuable information gained by study of the natural movements of calyces, renal pelvis and ureter. When the ureter is visible throughout its whole length on the film, the duct is the seat of a motor disturbance which may be internal, as with calculus or stricture, or external, as with inflammation of the male genital adnexa (seminal vesiculitis *et cetera*). When dilatation is localized to the lowermost portion of the ureter in the male, adnexal disease is strongly to be suspected. We must be careful of the significance of the term hypotonus as applied to the ureter, for skiagraphy does not permit us to distinguish a functional from a pathological dilatation. The term atony should be used only when there is complete loss of ureteric contractility. This is a rare condition and is hardly ever curable.

Special Articles on Treatment.

(Contributed by request.)

XXI.

TREATMENT OF STRICTURE OF THE URETHRA.

Acute Retention Associated with Stricture.

ALTHOUGH a stricture of the urethra may bring patient to medical attendant on account of difficulty in urination or because of certain occurrences associated with infection behind the stricture, it is convenient to begin with consideration of the treatment of acute retention arising from such obstruction.

In case the obstruction is not organic, but due to spasm of the sphincter muscle of the membranous urethra, the so-called "spasmodic stricture", one should first try morphine by injection or suppository (0.015 or 0.03 gramme—one-quarter or one-half grain—respectively), followed by a very hot bath. If urine cannot be passed in the bath or shortly afterwards, we proceed at once to a very gentle attempt to pass a medium size Tiemann's or Jaques's rubber catheter, or failing that, a medium size curved steel sound, preferably Clutton's or Liston's pattern. The latter instruments should be warmed and are gently pressed against the face of the stricture in a persuasive attempt to tire out the spasm.

In the event of failure, or if it is evident that the obstruction is not so deep as the membranous urethra, we proceed at once to use a fine woven silk bougie, size 3 French, in the presumption that we are dealing with an organic stricture. The tiny channel through the stricture is eccentric, so we avoid a straight tip to our bougie by bending about 0.5 centimetre at its end to an angle of roughly 30°. Woven silk bougies are boiled, then placed in cool lotion to become firm again. Good lubricants are sterile vaseline or sterile olive oil; the best of all is a coating of oil over a coating of vaseline. When the urine is very infected, or if the patient has previously exhibited a febrile reaction to instrumentation, an oxycyanide of mercury jelly lubricant is safer, though less perfect mechanically.

The penis is stretched taut with one hand; thumb and index finger of the other hold the bougie delicately and pass it down the canal till the face of the first stricture is reached; first, because more than one narrowing is present as a rule, and the deepest stricture is the narrowest. On reaching an obstruction one alternates movements of projection and retraction, delicately, and through only a little amplitude, rotating the bougie continuously the while, so that its bent tip searches for the eccentrically placed and tiny orifice. But though the opening lies eccentrically, the actual channel through the stricture may run more or less parallel with the long axis of the urethra, so that the coude tip may catch in its wall. This difficulty is met by bending the end of another bougie twice, so as to make a bayonet-shaped end with the actual tip running parallel to the long axis of the urethra.

The utmost delicacy and gentleness are essential in making these movements. Damage and even a false passage are easily caused. The stiffness of the bougie varies with the temperature of the lotion into which it is placed, but to use a very stiff bougie is inadvisable. For this reason, as well as because they are straight, whalebone filiforms should never be used. Indeed, they should never be manufactured. No grating, rough or "rubbery" path should be followed. When the bougie enters the correct channel it slips along smoothly as it runs through a non-strictured portion of the urethra, until the next narrowing is reached. We now repeat our back and forth movements, together with rotation, though there is less room for their performance; and so on till the deepest narrowing is passed.

We may now leave the filiform in place, tying a length of stout silk or thread around it and securing the ends along the sides of the penis with a circle of adhesive

plaster. After one or two hours urine begins to trickle alongside the bougie. After twelve hours or so larger bougies can be passed, and then a fine woven silk catheter, preferably with olivary tip, size about 7 or 8 French, and the bladder emptied. It matters little, however, if the fine silk catheter cannot be passed, for the patient can, as a rule, now pass urine.

In case of failure to pass a fine bougie, several filiforms are passed down to the obstruction; they will engage in any pockets or false passages; each of the bougies is now manipulated in turn, and one of them may pass through the stricture.

When no instrument can be passed a fine trocar and cannula are used suprapubically. Through a wheal caused by a local anæsthetic a tiny cut in the skin is made with a scalpel point about two centimetres above the upper margin of the *symphysis pubis*. Through this the trocar and cannula are plunged into the distended bladder in a backward and downward direction. When the flow ceases to issue readily the cannula is sharply withdrawn. provided the bladder is well distended and the instrument fine, there is no risk in this little manoeuvre; under other conditions there may be a distinct risk.

As a rule, some hours after aspiration a filiform bougie can be passed through the stricture. Rather than repeat aspiration several times, as occasionally seems necessary, an external urethrotomy should be done, provided the necessary instruments and skill are available. A suprapubic cannula should not be left in position for fear of urinary leakage into the cellular tissues.

Treatment of Stricture by Dilatation.

We shall now deal with stricture unassociated with retention of urine or other complications. Here again the examination is commenced with a medium size rubber or metal instrument, gently passed down to the obstruction, more to estimate its depth than in the intention of passing through. We now descend through a gamut of decreasing sizes of silk bougies till one will pass. This may be at any point from, say, 14 French down to 3 French.

In order to treat strictures properly it is necessary to have a complete range of olivary-tipped woven silk bougies from 3 French to about 20 French. Silk bougies are covered with a polished layer of shellac. Other satisfactory flexible bougies are made of various compositions and seem to be known generically as "gum elastic" bougies. The actual size should always be verified in a metal catheter gauge, for such bougies are often incorrectly marked.

Instrument firms still keep flexible bougies in stock graded according to the English scale, which should be abolished, since bougies advancing in size by its crude steps are unsuitable for the treatment of stricture. The gentleness which is the keynote of treatment is impossible with the English scale. Moreover, the numbers mean nothing, whereas the French scale indicates millimetres of circumference; division of this number by three gives roughly the diameter, and therefore a definite visual idea in millimetres of the thickness of the instrument. If the profession would get into the habit of demanding the French gauge only for rubber catheters and metal sounds as well as flexible bougies, the instrument firms would soon cease stocking the obsolete English scale.

When the stricture is very narrow the manoeuvres described in the preceding section are used. After size 7 or 8 French the tip of the bougie does not need deflection. One advances up the scale until a bougie is reached which just "fits" the stricture; that is, no force at all is necessary for its passage, but there is usually a slight "hang" on its withdrawal. It is a mistake to think that strictures should actually be dilated, though the term is generally accepted. A stricture is a scar with a congested surface, and responds to gentle massage better than to stretching. The "massage" comes from the mere presence of the bougie as it "fits" the stricture. Inflammatory exudate is gradually absorbed and, provided a suitable interval between treatments is allowed, the calibre of the narrowed channel opens up between instrumentations, so that larger and larger sizes of bougie or sound are needed in order to "fit" the stricture. The optimum interval varies with

different patients, but once a week is short enough as a rule. Some patients do better with a ten to fourteen day interval; in the latter class passage of instruments at short intervals irritates the stricture and causes its recontraction.

When size 18 to 20 French is reached, we proceed carefully to the use of curved metal sounds. The olivary-ended shape with a narrow neck (Lister's) should be avoided, since a "bursting" or wedge effect is caused by the disparity between the diameters of neck and shaft. Lister's sounds have a better shape, being round-ended with no narrow neck, and there is a difference of only four sizes in the French scale (two in the English) between the sizes of tip and shaft. Clutton's sounds are an improvement on the Lister pattern and should be used in preference to others; the upcurved extremity is not unnecessarily long, as in the Lister sound. Metal sounds are commonly made in gradations of the English scale, but it is a great advantage to possess a full set in the French scale, say, from 8/12 to 26/30 French.

As we proceed to the larger sizes of metal sounds we may gradually lengthen the interval between treatments, so that when the calibre is in the region of 26 French (that is, 15 English) the interval allowed may be three or four weeks.

It is by no means necessary to continue dilatation up to the full size of metal sound, that is, 26/30 French (16/18 English); a moderate size will allow free urination and prevent obstructive and infective complications as a rule. Once the maximum size judged necessary for the patient is reached, the interval may be extended regularly, but rather quickly, until finally the patient visits the practitioner only once in six, nine, twelve, eighteen, or even twenty-four months. The important thing is to warn the patient that a stricture is never completely cured, and that some form of supervision is always necessary.

Treatment of Stricture by Operation.

A cutting operation is necessary only in a small proportion of cases. The indications are: (i) impassable stricture, (ii) dilatation progresses to a certain insufficient degree and no further, (iii) the stricture is resilient, dilating readily but recontracting quickly, (iv) the presence of infective tendencies in the paraurethral tissues, bladder or kidneys after instrumentation, (v) a quicker treatment than that afforded by dilatation is required, (vi) the patient has to proceed to an isolated part out of reach of surgical aid.

The operation I prefer in most cases is combined internal and external urethrotomy. The sliding internal knife cuts all strictures anterior to the bulb, the latter being the only district treated in external urethrotomy. The addition of the latter operation divides the deepest and at the same time the narrowest strictured portion of the urethra on the floor as well as the roof; this improves the result, and the external incision provides drainage, a factor of safety in infected cases.

Internal urethrotomy can be performed only when the stricture is passable. The best instrument is the Thomson Walker modification of Maisonneuve's urethrotome. The canal is well opened up with metal sounds after the urethrotomy is performed, and then a large curved staff, grooved on its under surface, is passed. This staff is cut down upon in the perineal mid-line and the strictured portion of the canal is incised with a probe-pointed bistoury along its floor. The bladder is drained for four days by means of a large rubber or silk catheter passed along the urethra. The little wound is only partially closed. Before removing the catheter 30 cubic centimetres (two ounces) of 1% mercurochrome are injected into the bladder.

When the stricture is impassable the Wheelhouse operation of external urethrotomy is necessary. The urethra is dilated as well as is possible anterior to the bulbous portion and a Wheelhouse staff is passed down to the face of the deepest stricture. The staff is made to project boldly in the perineum and the urethra is opened by cutting on to the end of its groove. The walls of the canal are held apart by traction sutures. An extra glove is put on one hand and the forefinger massages the prostate and seminal vesicles *per rectum*. A fine probe is held in the other hand, ready to enter the strictured canal

at the spot where thin fluid is seen to issue. I always carry out this little manoeuvre at once, and find that it never fails, which is more than can be said for the numerous other methods advised for finding the strictured canal. Even if the assistant cannot completely control oozing of blood by swabbing, the prostatic and vesicular fluid shows up clearly amid the red blood. I then pass a grooved probe-pointed director, groove downwards, along the canal and then cut the stricture by sliding a fine probe-pointed bistoury along the groove. The point of a Teale's gorget is then passed along the groove in the director and onwards and upwards into the bladder, the director being simultaneously withdrawn. The gorget is used to guide a moderately large rubber or silk catheter along the urethra into the bladder. Final steps and after-treatment are the same as in combined internal and external urethrotomy.

Excision of a stricture is really an operation for the expert and is comparatively rarely required. It is the most thorough operation and, ideally, is suitable for any stricture, provided infective complications are absent and provided the portion requiring resection is not longer than about four or five centimetres. Excision is especially called for in strictures which relapse readily after urethrotomy.

Complications of Dilatation.

False Passage.—From the feeling of "grating" one suspects a false passage, and blood appears at the external meatus. An ice-bag should be applied to the perineum, rest is ordered, perineal pressure is made if necessary, and treatment is suspended for a week or two.

Infection.—If a rigor occurs, the patient is put to bed with hot bottles. Hot weak tea, quinine and aspirin and a saline purge are administered.

Prevention is better. Careful asepsis, the use of an antiseptic lubricant, administration of hexamine or neotropin the day before, of and after instrumentation, passage of urine and instillation of a few cubic centimetres of 1% mercurochrome just before instrumentation are suggested measures of safety.

Complications of Operation.

Hæmorrhage.—The Thomson Walker urethrotome is designed so as to prevent the sliding knife entering the prostatic urethra, where there is a danger of cutting the anterior portion of the internal meatus, a part which may bleed profusely. When the urethrotome is passed, it should not be depressed to more than an angle of 45° with the vertical; this will avoid the danger quoted above.

Usually little hæmorrhage comes from the incised stricture, and one advantage of combining the external with the internal operation is that a free exit is provided for blood or blood clots.

Sepsis.—A pyelonephritis may be lit up by the operation. In all cases of severe urinary infection complicating stricture a plain radiogram and intravenous urogram should be made before operation. If fear of sepsis is definite, the bladder should be drained suprapubically for a couple of weeks before urethrotomy is performed.

Complications of the Disease.

Periurethral Abscess.—Periurethral abscess develops as a result of spread of infection to the periurethral tissues from the urethra behind the stricture. This portion of the canal is dilated, congested and sometimes ulcerated. The abscess may develop insidiously or acutely and may cause partial or complete retention. Early opening by free median perineal incision is urgently called for. All partitions are broken down, the abscess flushed out with a hot one in ten solution of peroxide of hydrogen, and light iodoform gauze packing is inserted. The latter is renewed daily. When the wound has healed, or is at least clean, the combined urethrotomy operation should be performed.

Diffuse Phlegmonous Periurethritis.—Diffuse phlegmonous periurethritis is commonly known as "extravasation of urine", a misnomer, since urine is not actually extravasated. There is an acute, rapidly spreading cellulitis

associated with sloughing of the urethra behind the stricture. This complication may arise out of a periurethral abscess or occur suddenly without any warning. The limitation of spread by the fascia of Colles has led to the idea that urine extravasates. A fatal result may easily occur if the whole infected area is not drained as quickly as possible by multiple free, and fairly long, incisions into the cellular tissue. Incisions may even be necessary on the abdominal wall and the surface of the penis.

The cellular planes are freely irrigated through and through with a hot one in ten solution of peroxide of hydrogen. This is repeated four times a day, and hot eusol fomentations are applied between times. The bladder must not be drained suprapubically, since any interference with it may lead to sloughing of its mucosa from the virulent infection. Usually the dilated urethra sloughs and urine escapes through some of the perineal incisions.

When the patient's general condition permits, he should sit in a hot hip bath of weak potassium permanganate for half an hour three times a day. The stricture and the perineal fistula should not be treated until the infection subsides; the appropriate treatment is indicated in the following section.

Chronic Indurative Periurethritis.—Chronic indurative periurethritis is also known as "multiple fistulae of the perineum". The fistulae result from one of the complications just described and are usually multiple on the surface, though they may all open into a common cavity which in turn opens into the urethra.

In any case, if the stricture is passable, it is advantageous to perform internal urethrotomy first. A grooved staff is then passed and the mass of indurated fistulae is split through in the middle line until the urethra is opened on the staff. The whole of the indurated tissue is excised in two large masses on each side, the excision being extended far enough laterally to reach healthy tissue. One should not be timid in doing this. I have seen surgeons in Egypt, in bilharzial cases, remove so much tissue that the testes lay bare, and one wondered how they could be covered over again without a plastic operation. The wound is left open and the covering with skin may be left to Nature. The urethra is split open when all the fistulae are excised down to their source in the canal, and the stricture of the latter is cut. The after-treatment is the same as described for external urethrotomy.

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British Medical Association News.

SCIENTIFIC.

A MEETING OF THE NEW SOUTH WALES BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held on September 28, 1933, in the Robert H. Todd Assembly Hall, British Medical Association House, 135, Macquarie Street, Sydney. DR. A. W. HOLMES A COURT, the President, in the chair.

Post-Operative Intestinal Obstruction.

DR. ARCHIE ASPINALL read a paper entitled: "Intestinal Obstruction Following Operation on the Lower Part of the Abdomen" (see page 713).

DR. H. H. SCHLINK read a paper entitled: "Post-Operative Intestinal Obstruction in the Lower Part of the Abdomen" (see page 715).

DR. RALPH WORRALL thanked the speakers for their most suggestive and valuable papers. In regard to the administration of morphine, Dr. Worrall said that if it were given in the first twenty-four hours nothing but good could result; later than that, it should be given only in

the circumstances mentioned by the speaker. No harm could come from the giving of frequent small doses. Morphine checked oozing and abolished shock; it buried the memory of all the disagreeable matters connected with the operation, and was one of the most valuable measures in their repertoire. He agreed with Robert Hutchison when he said that he hoped, when his time came, that he would fall into the hands of a man who understood the use of morphine.

In regard to acute dilatation of the stomach, the symptom of pain had not been mentioned. The stomach must be washed out numerous times. Dr. Worrall mentioned a case in which the patient had been in a very low condition from acute dilatation after operation. The sutures were not taken out until the eighteenth morning; the wound burst open the same evening; it was resutured with the patient lying in the bed; it did not suppurate and the patient recovered.

Dr. Worrall said that he intended to air some of his fads. He agreed with most of what Dr. Schlink had said, and had indeed made many of those statements himself. He had learnt from *post mortem* examinations that one should never hesitate to reopen wounds if it seemed necessary. He cordially agreed that a common cause of obstruction was that a coil of the intestine became adherent to some raw surface in the pelvis. Therefore, on reopening the abdomen, the operator should first put his hand in and lift out that coil.

There were two main forms of post-operative intestinal obstruction, septic and mechanical, and the second form was much more important than they often imagined. In septic obstruction, of which paralytic ileus was the terminal stage, the patient was seen to be not well from the first; vomiting, raised pulse and temperature, aspect, abdominal distension, all denoted this. The infection was from the peritoneum, which was a huge lymph sac, but if the patient died, she died of intestinal toxæmia. When the patient died from mechanical obstruction the result was the same, but the route was different and the onset insidious. For instance, if on the sixth or subsequent days after operation vomiting recurred, they should assume that intestinal obstruction was present until the contrary was proved. The pulse did not rise until comparatively late, but vomiting was one of the first signs of intestinal obstruction. Promptness of action was essential and the essence of the cure. If the condition was anticipated early, the measures necessary would be less dangerous and less distressing. Dr. Worrall spoke of succussion as a most valuable measure if the condition was purely mechanical from an adherent intestinal coil in the pelvis. By lifting the patient with the hands under her knees so that she rested on the upper part of her back and neck, and jerking her up and down two or three times, then raising the foot of the bed and giving an enema, Dr. Worrall had in two instances averted a more serious condition and brought about complete recovery.

The second method of dealing with the condition was to reopen the wound, put the hand into the pelvis, separate and lift up the adherent coil. At a later stage it would be necessary to empty the bowel of the stagnant foul pool that was poisoning the patient. Some attempted to do this by multiple enterostomy, which Dr. Worrall considered to be useless and dangerous. In one case he had made three punctures and emptied out a lot of foul stuff; after two days the symptoms recurred. The wound was reopened for the third time, although the patient appeared moribund. The first coil of intestine that presented was taken and a purse string suture was inserted into its wall. An opening was made into the bowel, a catheter was inserted through the opening and stitched to the wall of the bowel, the bowel wall was invaginated and the purse string suture was tied. A second purse string suture was applied and the coil of intestine was dropped back into the abdomen. The bowel was not stitched to the parietes. The passing of the enterostomy tube through the omentum, as advised by Dr. Wesley Long, was a device worth bearing in mind. The wound healed in from eight to ten weeks afterwards. In two other similar cases there had been the same happy result. Dr. Worrall stressed the value of enterostomy in draining the stagnant pool in the intestine. It was a life-saving measure.

Dr. T. W. LIPSCOMB said that he had nothing but praise for the two speakers and for the excellent résumé they had given of the subject. They all had their own fads and fancies in the work they did. He spoke of the work that he had read on the giving of glucose. It was known from experimental work that when glucose was given by the rectal route it was not absorbed. Evidently it did good only when it was given intravenously and not by the rectum. Dr. Lipscomb had nothing but praise for spinal anaesthesia in cases of this sort, whether the condition was mechanical or paralytic ileus. In any case, the operating theatre should be prepared as for an operation and spinal anaesthesia should be given. If the obstruction was not mechanical the bowel would act, and there was no need to go any further. Otherwise they could go ahead and open the abdomen. When the patient was vomiting it was rather hard to ask the resident practitioner to give an anaesthetic.

Dr. Lipscomb wished to join issue with Dr. Worrall about the free use of morphine. In his own practice he gave all patients a preanaesthetic injection of paraldehyde by the rectum, which made their recovery from the anaesthetic more comfortable and minimized the need for a sedative. He thought that morphine should be given only in the smallest possible doses.

In resuturing, if the wound had to be reopened, Dr. Lipscomb thought that the proper suture was silk worm gut.

Dr. Lipscomb considered that when patients were dehydrated as a result of vomiting, the saline solution administered intravenously should be in solution higher than normal to make up for the patient's loss of chlorides.

Dr. G. H. AMBOTT thanked the gentlemen who read the papers, and also Dr. Worrall. He had seen great progress. In the older days there were more cases of obstruction than there were now. Surgeons did not take the same care in leaving the abdomen free of blood, and the stitching inside the abdomen and of the abdominal wall used not to be so carefully done. One of the great lessons to be learnt was to handle the tissues as carefully as possible, to stop all bleeding, to leave the abdomen clean, and to stitch up as carefully as possible. Probably these were the main factors in Dr. Schlink's success.

Dr. R. I. FURBER said that since they were speaking of fads, pads were his. He thought they were one of the main causes of post-operative ileus, as they traumatized the peritoneum and dragged on the root of the mesentery. Fat, difficult anaesthesia and other factors sometimes made the use of pads essential, and ileus might be safely forecast if they were extensively used. The early absorption of catgut in the peritoneum had been mentioned, and he thought this was a matter of considerable importance, particularly when the sutures had been put in under tension. When this occurred the tissues opened out and left a raw surface ready for adhesion formation. Dr. Furber agreed with Dr. Worrall in the use of morphine in the first twenty-four hours. The patient was thus relieved of pain, which was the principal cause of shock. The use of a basal anaesthetic, such as "Nembutal" or "Amytal", diminished psychic and post-operative shock. Even small doses of "Amytal", he had found, were valuable in removing fear.

Dr. H. C. RUTHERFORD DARLING added his quota of congratulations to the speakers on this most important subject. They knew most about the mechanical forms of obstruction, but of non-mechanical or inflammatory ileus they knew little. Supposing that a suppurating appendix had ruptured and coils of intestine, dilated and inflamed, were found with pus free in the pelvis, then, by the insertion of a drainage tube, the patient might be cured. But with inflammatory ileus it was different. The pelvic ileum was collapsed, red, edematous, soft and velvety. Higher up the intestines were normal, though congested and distended. Taking the collapsed part, in which there was no mechanical obstruction, was this not a question of inhibition as described by Alvarez, and not a muscular paralysis as was formerly thought. "Stovaine" would not be effective for anything in the way of a paralytic obstruction; but spinal anaesthesia frequently cured non-mechanical ileus. They would find that the factors to be

considered in the morbid physiology were a fall in blood chlorides and a rise in non-protein nitrogen and also dehydration. Dr. Schlink had hit the nail on the head when he spoke of toxæmia being produced in the upper part of the intestine. The symptoms usually occurred after the post-operative aperient had been given on the third day. The patient was restless, the pulse went up, there was distension and vomiting. The process was one of inhibition, as after an operation for intestinal anastomosis. If Dr. Darling was told that the aperient did not act, he followed Barnard's rule and gave two enemata at an interval of one hour; this would either prove or disprove the presence of intestinal obstruction.

Dr. Darling said that Edye had shown that the non-passage of flatus was more important than the non-passage of faeces (which might colour the second enema). When a diagnosis of obstruction had been made Dr. Darling said that alimentary rest for six or eight hours was necessary, and copious intravenous medication. Beneficent quietude was promoted by aspirating the stomach contents through a Jutte tube, the latter being left *in situ*. Normal saline solution should be introduced by the drip method into either axilla or thigh and a 10% glucose solution slowly instilled into a convenient vein every four hours. If at the end of eight hours a well given enema of turpentine, quinine sulphate or ox bile failed to prove effectual, immediate operation must be considered. Gosset's 6% saline solution (one or one and a half pints) should be injected into the veins. French surgeons tested the patient's condition by giving hypertonic saline solution. If colic occurred with no action of the bowel, a diagnosis of mechanical intestinal obstruction was made. Then spinal anaesthesia was used and if there was no result the abdomen had to be opened. Dr. Darling referred to the importance of Dr. Schlink's view of emptying the intestine. He himself could not come near to Dr. Schlink's 100% standard of success. If the condition was discovered early, he tried to do an anastomosis between the ileum and the ascending colon combined with caecostomy; but if the patient had gone on for three or four days this was out of the question. It only remained to put a small catheter into the bowel as an ileostomy.

Dr. H. C. E. DONOVAN thanked the readers of the papers for the way in which they had brought out the points of this dreadful complication. They left little to say. Dr. Donovan agreed with Dr. Furber that pads had quite a definite effect in causing these complications, especially when they were misused and repeatedly pulled out and put in again. In the upper part of the peritoneum they were held by Lockhart-Mummery to be the greatest cause of pulmonary embolism.

Dr. Donovan mentioned the recent work that had been done in giving massive doses of gas gangrene antiserum. He himself had never used this serum, but he knew of cases in which its value had been proved.

The use of pituitary extract and eserine was disappointing by the time that distension had developed. But Dr. Donovan used them as a routine after the removal of a pus tube and he thought they went a long way towards preventing post-operative distension. Haemostasis was also of great value in prevention. Dr. Donovan was glad that the idea of leaving blood clot in the abdomen in operating for ectopic gestation had fallen into disuse.

Dr. B. T. EBYE congratulated Dr. Schlink and Dr. Aspnall on their comprehensive papers. In regard to the early diagnosis of intestinal obstruction, Dr. Edye said that he considered splashing to be a sign of great value. The patient's pulse and temperature might not be disturbed; he might appear comfortable with the abdomen not obviously distended; but when the lower part of the abdomen was palpated sharply, splashing was noted. The sign was generally conclusive evidence of obstruction.

In regard to treatment, nobody had discussed the type in which there was obstruction after operation for septic appendicitis. In such an instance it was dangerous to disturb the wound, and the site of operation should be left alone. An opening could be made on the left side through the rectus muscle, the first presenting coil of distended bowel taken and a tube put into it, as Dr. Worrall had described. After a few days, when the septic process

was subsiding, the bowels usually began to function normally. The tube could then be removed and the enterostomy allowed to close spontaneously.

Dr. Edey mentioned the type of obstruction from adhesions or bands where distension was extreme. In such circumstances a tube could be stitched into the bowel and the bowel emptied before the obstruction was sought. The tube was afterwards brought through a stab wound and the original wound closed; the stab wound would heal when the tube was removed. If the tube were brought through the original wound, the wound would probably break down.

Dr. JOHN STOREY expressed his sincere thanks to the readers of the papers. He said that in some quarters the seriousness of opening the patient's abdomen was not sufficiently realized. He did not care how skilful the surgeon was, the patient who had had his abdomen opened was not so well off as one who had not. The surgeon should think well before performing a laparotomy.

There were one or two points in Dr. Aspinall's paper with which Dr. Storey could not quite agree. He thought that the less adequate the pre-operative preparation, the better the patient was likely to do; the greatest danger was over-preparation rather than under-preparation. He referred especially to over-purgation and the impossibility of stopping a nurse from giving an enema. Dr. Storey said that in general peritonitis there was not visible peristalsis. He agreed with Dr. Edey that splashing was an important sign. Some surgeons found the binaural stethoscope useful in distinguishing between large and small bowel obstruction. When obstruction was present the note was quite pathognomonic. Dr. Storey also mentioned the characteristic stale-fish smell of the vomitus in these cases.

Dr. Storey stressed the importance of gentleness in handling the tissues of these patients. He knew of practitioners who punched the tissues instead of dabbing them. In regard to the use of pads, Dr. Storey asked Dr. Furber how he proposed to avoid their use.

It was much more serious, he said, to do a mid-line incision rather than an incision in the flank. The importance of the intravenous administration of a 10% solution of glucose with insulin had not been sufficiently stressed. As to gas gangrene antiserum, Dr. Storey thought that it did good and was a decided help. He was pleased to hear Dr. Schlink mention the use of a cannula, for as much fluid as possible should be emptied out.

With regard to enterostomy, his experience was that the chance of saving the patient by this means was very remote. Dr. Storey thought that a Paul's tube would act just as well as, if not better than, a catheter. The best article on this subject, he thought, was Paul's article in Binney's "Treatise of Surgery", Volume II.

In conclusion, Dr. Storey asked if any of the members present knew of anything that might be put into the abdomen to prevent adhesions. Would saline solution or paraffin have this effect? Personally, he did not think so.

Dr. Aspinall, in reply, thanked the speakers for the interesting discussion. He had hoped to invite discussion. In regard to the use of pads, Dr. Aspinall admitted that, when used roughly, they were a cause of trauma; but how was their use to be avoided? How could they avoid contamination of the intestine? Rubber tissue seemed awkward. He thought that perhaps pads were kept in use too long.

In regard to gas gangrene antiserum, Dr. Aspinall said that he had used it only when it was too late. They should give it only when they anticipated the obstruction.

Dr. Edey's suggestion about opening the abdomen on the left side was valuable. The method had been used by him. Replying to Dr. Storey's remarks about visible peristalsis, Dr. Aspinall said that the slide shown on the screen was taken from Keen's "Surgery"; it was from a case of obstruction with general peritonitis. As to the onset of general intestinal obstruction, Dr. Aspinall thought that vomiting was not the first sign; he thought it most often showed itself first by little colicky pains.

Dr. Schlink, in reply, thanked the speakers for their remarks. As no one surgeon met with an unlimited number of these complicated and anxious cases, it was

eminently desirable that discussions such as the present should occasionally take place, for only by each surgeon contributing his quota of experience could a large enough number of cases come under review and so allow sound and authoritative general principles to be laid down in diagnosis or treatment for the benefit of the profession. All would admit that their very souls were worried when confronted with these grave cases, due mainly to lack of experience in early diagnosis and management.

Dr. Schlink thought that much of the diversity of opinion regarding the signs and symptoms of the condition depended on the stage at which the case was seen and diagnosed. The signs and symptoms changed at every hour. Although he agreed with Dr. Worrall that vomiting always acted as a background for the drama, from his experience he regarded the crossing (even if only transitory) on the chart caused by the sudden elevation of the pulse and the fall of the temperature as one of the earliest signs, marking the point at which the actual pathological condition started.

Dr. Lipscomb had mentioned the giving of glucose *per rectum*. Dr. Schlink believed in saline solution so long as a sufficient quantity was given to replace the loss of chlorides brought about by the vomiting, and the results were, in his opinion, about the same.

Dr. Schlink agreed with Dr. Abbott's remarks about the rough handling of the abdominal contents as an exciting cause of post-operative obstruction, and laid stress on the care with which the inflamed intestines should be handled when reopening for these obstructive conditions. He agreed also with Dr. Furber that the sponges used in the abdomen should be gently placed in position and be not too hot and not too cold. Their gentle placing depended almost entirely on good and complete anaesthesia, which should be deep enough to allow the intestines to roll out of the pelvis of their own accord, the sponges then acting merely as a screen without pressure.

Dr. Schlink agreed with all the speakers regarding the giving of morphine. In the first twenty-four hours morphine should be given; it was necessary to combat shock. But repeated giving of morphine was to be deplored. He quoted a patient to whom, between Friday and Wednesday, seven doses of morphine had been given.

Replying to Dr. Darling, he thought that a clear distinction must be made between: (i) the so-called ileus, (ii) true bowel stasis, (iii) mechanical obstruction. The first was the result of peritonitis, which inflamed the intestines, stopping peristalsis and so causing accumulation of septic contents; but there was no actual block or kink. The second arose from a nervous origin and was unaccompanied by peritonitis, and the third was due to actual obstruction by band or kink, usually originating from a local inflammatory area or a collection of blood in the pelvis. He regarded anything in the nature of anastomosis or resection as usually too much for the patient's resistance in these desperate cases.

In reply to Dr. Donovan, Dr. Schlink said he had not had much experience of the serum for gas gangrene. It seemed not very logical to aim at sterilizing the septic contents above the stoppage; such a procedure could be part of the treatment, but not the whole treatment.

He agreed with Dr. Edey that gurgling and splashing were a helpful sign in diagnosis, but thought that the stethoscope was more reliable than the hand.

Referring to Dr. Storey's remarks, Dr. Schlink said that Paul's tube for drainage was very good when nothing else could be used; but if the condition of the bowel was so bad that its musculature would not work, such a tube would only drain the loop in which it was inserted. He preferred to use the method he described for emptying the septic contents of the bowel, the advantage being that all loops could be rapidly evacuated and the abdomen closed without drainage of any kind. The bowel was thus able to regain its tone and attend to any further accumulation itself.

When Dr. Aspinall talked of the preparation of the patient, he undoubtedly meant the pre-operative washing out of the stomach more than the cleansing of the skin. Such a procedure was essential.

In conclusion, Dr. Schlink said that every case of intestinal obstruction should be studied on its merits and a definite diagnosis made between ileus secondary to peritonitis, true bowel stasis without peritonitis due to some nervous influence, and mechanical obstruction due to band or kink which might be complicated in its final steps by secondary peritonitis. This differential diagnosis was necessary as the details of treatment were different in each case.

Dr. Aspinall, speaking again in reply to Dr. Storey, said that the patient should be in hospital some time before operation for an accurate diagnosis to be made and to provide for adequate pre-operative care. Dr. Storey asked if there might not be some improvement made in the type of bed pans used. Reference was made to the use of special beds to eliminate bed pans, but it was pointed out that this would perhaps be economically impossible.

Dr. Aspinall said that in these cases good nursing made a tremendous difference. A good nurse saved the patient from unnecessary exhaustion.

Dr. HOLMES A COURT, from the chair, expressed great appreciation of the papers and of the interesting discussion that had followed. Although the subject had been a surgical matter and therefore holy ground on which it would be dangerous for a physician to tread, he wished to remark that since Fagge had advanced the intrathecal use of "Percaïne" for paralytic ileus unassociated with peritonitis he had encountered two cases, one of renal colic and one of gastric hæmorrhage, in which "Percaïne" had acted well.

NOMINATIONS AND ELECTIONS.

THE undermentioned have been elected members of the New South Wales Branch of the British Medical Association:

Ada, William Maurice, M.B., B.S., 1931 (Univ. Sydney), St. George District Hospital, Kogarah.
Ross, Alexander William, M.B., B.S., 1930 (Univ. Sydney), c.o. Dr. M. Thomas, Manly.
Starr, Kenneth William, M.B., B.S., 1930 (Univ. Sydney), Newcastle Hospital, Newcastle.
Ternes, Alfred Christopher, M.B., B.S., 1927 (Univ. Sydney), Portland.

Correspondence.

COMMONWEALTH MEDICAL REFEREES.

SIR: Now that the Commonwealth Government is restoring some part of the reductions made in salaries, pensions *et cetera* under the *Financial Emergency Act*, it is to be hoped that the medical profession will see that it, too, shares in the increases.

I would earnestly suggest that every medical man who acts as a Commonwealth medical referee for pensions purposes write to the Treasurer requesting a restoration of the fee for visiting applicants for invalid pensions, now 12s. 6d., to its original amount, 15s., and also that the whole of the work be restored to those medical men who for years have acted as medical referees.

Yours, etc.,

PAUL G. DANE.

110, Collins Street,
Melbourne.
October 31, 1933.

"WHEN HALF GODS GO."

SIR: References to patients and their doctors are not uncommon on the stage, but are often so ludicrous as to annoy rather than amuse medical men. No incongruity could, of course, be so extreme as to dull the delight of

the rest of the audience. We may then welcome a play that treats at some length of surgical matters and so accurately as completely to satisfy the most exacting.

"When Half Gods Go", such a play, was produced at the Savoy Theatre in Sydney on Saturday, November 11, and, needless to say, one of the joint authors, Charles Edgbaston and R. J. Fletcher, is a member of the medical profession.

The play deals with the increasing blindness from glaucoma of a middle-aged scientist who has already lost all vision in one eye. The patient's undue optimism and domestic worries have caused him to delay consulting his ophthalmic surgeon until too late for relief by trephining, but an iridectomy, performed on the stage, succeeds, and the first week's progress is excellent till a slight injury, received when the patient discovers his wife's infidelity, bursts the scar and destroys the eye.

The unhappy victim, believing himself now useless to the community and a burden on his family, and already convinced of the moral justness of suicide in the circumstances, decides to take his life.

The foibles and extravagances of opiated patients who understand their own cases far better than do their doctors, afford comic relief in an uproariously humorous scene, and two fashionable quackeries, spiritual healing by a vulgar medium and laying on of hands by a lay preacher, are suitably but restrainedly rebuked, although the medium finally scores an undeserved success.

Dramatic criticism does not come within my province, but we must compliment the skill with which the opposing views both of the staid husband and of the flighty young wife are so sympathetically presented, and, despite a few weaknesses, the generally successful structure of the drama. "Charles Edgbaston", a Sydney oculist, is to be congratulated on this first effort.

Yours, etc.,

"M.D."

Sydney,

November 14, 1933.

Obituary.

THOMAS LANE BANCROFT.

WE regret to announce the death of Dr. Thomas Lane Bancroft, which occurred on November 12, 1933, at Wallaville, Queensland.

University Intelligence.

THE UNIVERSITY OF SYDNEY.

A MEETING of the Senate of the University of Sydney was held on November 6, 1933.

The Senate resolved to accept with grateful thanks from Professor Andrew Lawson, of the University of California (United States of America), and his brothers, as a gift to the University of Sydney, a portrait of the late Professor A. A. Lawson, formerly Professor of Botany in this University.

The Senate resolved not to apply the recent reduction in the basic wage.

The Directors of Messrs. W. D. and H. O. Wills (Australia), Limited, forwarded a donation of ten guineas for the purchase of reference books for the Department of Chemistry. The gift was accepted with grateful thanks.

The Superintendent of the United Dental Hospital advised the Senate that the Government was erecting a Research and Pathology Department in the Dental Hospital and that £1,000 had been provided by the Australian Dental Association and the Walter and Eliza Hall Trust for the purpose of equipping the laboratory.

The Senate selected the Faculties of Arts, Law, Medicine, and Agriculture to elect Fellows representative of the Teaching Staff for the two-year period commencing January 1, 1934.

The following appointments were approved: Dr. Ian Henning as Acting Lecturer in German during 1934; Dr. Oliver Latham, Dr. G. A. M. Heydon, Dr. F. V. McAdam, and Dr. W. A. Bye as Honorary Demonstrators in Anatomy; Dr. F. A. Maguire and Dr. I. D. Miller as External Examiners in Anatomy for the Third Degree Examination in Medicine; Dr. P. L. Hipsley as Lecturer in the Surgical Diseases of Children at the Royal Alexandra Hospital for Children; Miss R. Burns as Technician in the Deep Therapy Department at Sydney Hospital.

Books Received.

MATERNAL MORTALITY AND MORBIDITY: A STUDY OF THEIR PROBLEMS, by J. M. Kerr; 1933. Edinburgh: E. and S. Livingstone. Crown 4to., pp. 400, with illustrations. Price: 25s. net.

ROSE AND CARLESS' MANUAL OF SURGERY FOR STUDENTS AND PRACTITIONERS, by C. P. G. Wakeley, D.Sc., F.R.C.S., F.R.S., and J. B. Hunter, M.Chir., F.R.C.S.; Fourteenth Edition; 1933. Royal 8vo., pp. 1495, with illustrations. Price: 30s. net. (This book is also being published in two volumes, at the same price.)

Diary for the Month.

Nov. 28.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Nov. 29.—Victorian Branch, B.M.A.: Council Meeting.

Nov. 30.—New South Wales Branch, B.M.A.: Branch.

Dec. 4.—New South Wales Branch, B.M.A.: Organization and Science Committee.

Dec. 5.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

Dec. 6.—Western Australian Branch, B.M.A.: Council.

Dec. 6.—Victorian Branch, B.M.A.: Annual Meeting.

Dec. 7.—South Australian Branch, B.M.A.: Council.

Dec. 8.—Queensland Branch, B.M.A.: Branch (Annual).

Dec. 12.—New South Wales Branch, B.M.A.: Ethics Committee.

Dec. 14.—Victorian Branch, B.M.A.: Council.

Dec. 14.—New South Wales Branch, B.M.A.: Branch.

Dec. 15.—Queensland Branch, B.M.A.: Council.

Dec. 19.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments.

Dr. J. F. Adamson (B.M.A.) has been appointed Certifying Medical Practitioner at Bacchus Marsh, Victoria, pursuant to the provisions of the *Workers' Compensation Act, 1928*.

Dr. F. S. Oldham has been appointed as a Quarantine Officer (Plants), New South Wales, under the *Quarantine Act, 1908-1924*.

Dr. A. J. Hakendorf has been appointed Temporary Honorary Anaesthetist at the Adelaide Hospital, South Australia.

Dr. B. Smeaton (B.M.A.) has been appointed Honorary Consulting Surgeon at the Adelaide Hospital, South Australia.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser", pages xvi and xvii

AUSTIN HOSPITAL FOR CANCER AND CHRONIC DISEASES, HEIDELBERG, VICTORIA: Resident Medical Superintendent.

DEVON PUBLIC HOSPITAL, LATROBE, TASMANIA: House Surgeon.

PARRAMATTA DISTRICT HOSPITAL, PARRAMATTA, NEW SOUTH WALES: Junior Resident Medical Officer.

THE UNIVERSITY OF MELBOURNE, VICTORIA: Lecturer in Anatomy and Histology; Junior Part-Time Demonstrator.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmoral United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Brisbane Associated Friendly Societies' Medical Institute. Chillagoe Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their agreement to the Council before signing. Lower Burdekin District Hospital, Ayr.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	Combined Friendly Societies, Clarendon and Kangarilla districts. All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor", THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

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